THE PRESIDIO TRUST

November 7, 2007

Mr. Devender Narala
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Revised Draft Implementation Work Plan & Technical Specifications
Building 207/231 Area
Presidio of San Francisco, California

Dear Mr. Narala:

Enclosed are copies of the following documents:

- *Revised Draft Corrective Action Implementation Work Plan, Building 207/231 Area, Presidio of San Francisco, California, Volume 1*, dated November 2, 2007 (Draft Work Plan);

- *Revised Draft Construction Documents for Corrective Action Implementation, Building 207/231 Area, Presidio of San Francisco, California, Volume 2,* dated November 2, 2007 (Draft Technical Specifications);

- *National Park Service Comments to the Draft Work Plan dated March 5, 2007 with written responses,* (NPS Comments). Included as Appendix K to Volume 1.

These documents describe plans for implementation of corrective actions identified in the *Final Building 207/231 Corrective Action Plan (CAP), Presidio of San Francisco, California*, dated October 2007. These technical documents and responses to NPS comments were prepared by MACTEC for the Trust.

The Trust utilized an integrated team approach during the development of the Work Plan. The integrated team consisted of staff from the Trust, NPS, DTSC, RAB, and the Water Board. Many of these individuals played a significant role in the development of the Work Plan and will be closely involved in this next review.

We would like to thank all integrated team members and look forward to working with everyone as we finalize the design. We are requesting comments from the entire integrated team by November 28, 2007 to allow us two weeks to develop responses by the final Integrated Team Meeting scheduled for December 12, 2007.

Please call me at (415) 561-4259 if you have any questions or comments.

Regards,

Craig Cooper
Remediation Program Manager

Enclosure

cc: Robert Boggs, DTSC
Brian Ullensvang, NPS (2 copies)
Doug Kern, RAB
Mark Frey, Trust Natural Resources
Denise Fraga, Trust Remediation Library
Barbara Janis, Trust Main Library

Volume 1

Revised Draft
Corrective Action
Implementation Work Plan
Building 207/231 Area
Presidio of San Francisco, California

Prepared for

The Presidio Trust
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MACTEC Project No. 4084075106 02

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November 2, 2007

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Revised Draft
Corrective Action
Implementation Work Plan
Building 207/231 Area
Presidio of San Francisco, California

MACTEC Project No. 4084075106 02

This document was prepared by MACTEC Engineering and Consulting, Inc. (MACTEC) at the direction of the Presidio Trust (Trust) for the sole use of the Trust, the National Park Service (NPS), and regulatory agencies, the only intended beneficiaries of this work. No other party should rely on the information contained herein without the prior written consent of the Trust. This report and the interpretations, conclusions, and recommendations contained within are based, in part, on information presented in other documents that are cited in the text and listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents.

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ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethane
1,2-DCB	1,2-dichlorobromine
AC	asphalt concrete
ACMs	asbestos containing materials
Army	United States Department of the Army
ASC	Anthropological Studies Center
BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
BMPs	best management practices
BTEX	benzene, toluene, ethylbenzene, xylenes
Cal OSHA	California Occupational Safety and Health Administration
CAP	Corrective Action Plan
CCR	California Code of Regulations
Cleanup Level Document	Development of Presidio-wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water
COC	chemical of concern
Construction Documents	Construction Drawings and Technical Specifications
Contractor	Excavation Contractor
County	County of San Francisco Department of Environmental Health
CQA	Construction Quality Assurance
CSP	Confirmation Sampling Plan
cy	cubic yards
°C	degree Celsius
DO	dissolved oxygen
DOT	Department of Transportation
DPT	direct push technology
DTSC	Department of Toxic Substances Control
Dup	duplicate samples
EDD	electronic data deliverable
EKI	Erler and Kalinowski, Inc.
EMP	Erosion Monitoring Plan
Engineer	Design Engineer
EPA	Environmental Protection Agency
ESLs	environmental screening levels
FDS	fuel distribution system
FPALDR	Fuel Product Action Line Level Development Report
GGNRA	Golden Gate National Recreation Area
GIS	Geographical Information System
GSA	General Services Agency
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation-derived waste
LTTD	low temperature thermal desorption
LUC	land use control
LUCMRR	Land Use Control Master Reference Report
MACTEC	MACTEC Engineering and Consulting, Inc.

MCLs	maximum contaminant limits
MeCl	bromobenzene, methylene chloride
mg/kg	milligrams per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MTBE	methyl tertiary butyl ether
N squared	NEPA and NHPA single review
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NOT	Notice of Termination
NPS	National Park Service
OCP	organochlorine pesticides
ORC Advanced™	Oxygen Release Compound Advanced ™
OVM	organic vapor measurement
PAH	polynuclear aromatic hydrocarbon
PCBs	Polychlorinated Biphenyls
PCC	Portland cement concrete
PCE	tetrachloroethene
Phase I IA	Phase I Interim Action
PID	Photo-ionization detector
Plan	Construction Procedures Plan
PLLW	Presidio lower-low water
POTW	Publicly Owned Treatment Works
Presidio	Presidio of San Francisco, California
PTMP	Presidio Trust Management Plan
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RAB	Presidio Restoration Advisory Board
RAO	Remedial Action Objectives
RB	Rinsate blank
Redox	reduction-oxidation
RFI	Requests for Information
ROI	radius of influence
RU	remedial unit
SF Coroner	San Francisco Coroner's Office
sf	square feet
SOP	Standard Operating Procedure
the Site	Building 207/231 Area, Presidio of San Francisco, California
SSHP	Site Safety and Health Plan
SWPPP	Storm Water Pollution Prevention Plan
TB	trip blank
T&R	Treadwell & Rollo, Inc.
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TPH	total petroleum hydrocarbon
TPHd	total petroleum hydrocarbon as diesel
TPHfo	total petroleum hydrocarbon as fuel oil
TPHg	total petroleum hydrocarbon as gasoline

the Trust	Presidio Trust
µg/kg	milligrams per kilogram
µg/L	micrograms per liter
USA	Underground Services Alert
USEPA	United States Environmental Protection Agency
UST	underground storage tank(s)
UXO	unexploded ordnance
VC	vinyl chloride
VOCs	volatile organic compounds
Water Board	Regional Water Quality Control Board
Water Board Order	Water Board Order No. R2-2003-0080
WET	Waste extraction test
Work Plan	Corrective Action Implementation Work Plan

EXECUTIVE SUMMARY

On behalf of the Presidio Trust (Trust), MACTEC Engineering and Consulting, Inc. (MACTEC) prepared this Corrective Action Implementation Work Plan (Work Plan) to implement the corrective actions at five remedial units (RUs) proposed in the *Building 207/231 Area Final Corrective Action Plan, Building 207/231 Area, San Francisco, California* (CAP). The Building 207/231 Area (Site) comprises approximately 8 acres of land in the northeast portion of the Presidio of San Francisco, located south of the Crissy Marsh. Doyle Drive/Highway 101 north- and south-bound overpasses bisect the Site.

The purpose of the corrective actions are to achieve "clean closure" for unrestricted reuse of the Site. This Executive Summary provides a summary of site background and RUs identified in the CAP, and summarizes the Work Plan's general and RU-specific corrective action activities.

Background

The Site is within the Presidio of San Francisco National Historic Landmark District. Historic resources designated for preservation include Building 228 and historic walls south and southwest of Building 231. Potential planned uses of the Building 207/231 Area include onsite restoration of the Quartermaster's Reach of the adjacent Crissy Marsh and freshwater Tennessee Hollow Riparian Corridor adjacent to a historic wall in the southern portion of the Site, replacement of the Doyle Drive/Highway 101 overpasses, and continued use of existing buildings by tenants and preservation of historic structures. Cleanup levels for soil and groundwater were identified using the most stringent (lowest) of up to four different scenarios assuming human and ecological receptors that may be present at the Site during reuse.

Five different soil RUs and four co-located groundwater RUs require cleanup due to the presence above cleanup levels of total petroleum hydrocarbons (TPH) as gasoline, diesel, and/or fuel oil; volatile organic compounds (VOCs), and less-extensive occurrences of polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides, and metals.

<u>*Corrective Actions for Southern Portion of Site Behind Historic Wall*</u>: The approved corrective action for the Building 228 RU that occurs in the southern portion of the Site consists of in situ injection of an oxygen releasing compound to stimulate biodegradation of residual petroleum hydrocarbons in the saturated zone of the subsurface in the northern portion of the RU; inspection of the existing indoor cap (building foundation) and outdoor cap (paved areas) in the northern and southern portions of the RU, and improvements and maintenance, as necessary; assessment of vapor intrusion to indoor air within Building 228 through collection of sub-cap vapor samples and indoor air monitoring; groundwater monitoring; and a land use control (LUC). The corrective action was selected because residual contamination is present between the historic building and wall that are important cultural resources designated for preservation.

The corrective action addresses two separate portions of the Building 228 RU:

- <u>Northern Portion of the RU</u>—Existing Building 228 that contained a former dry cleaning facility and the area north of the building that contained former Stoddard solvent and heating oil underground storage tanks (USTs) adjacent to a historic wall; and

- <u>Southern Portion of the RU</u>—An area adjacent to the southeastern corner of Building 228 where a former fuel distribution system (FDS) line was located.

Corrective Actions for Northern and Central Portions of Site: The approved corrective action for the four RUs that occur in the northern and central portions of the Site consists of removing contaminated fill—the source of contamination to groundwater—to achieve clean closure for unrestricted reuse. This will be achieved through excavation and offsite disposal of contaminated soils and backfill with natural sands, followed by downgradient groundwater monitoring to confirm source removal has reduced impacts to groundwater for the following RUs:

- Former Building 207 fueling station and adjacent Former Building 208 sump in the northern portion of the Site (Former Building 207 RU);
- Former Buildings 38, 38-A, and garage oil station in the northeastern portion of the Site (Former Building 38 RU);
- Existing Building 231 and former service station complex in the central part of the Site (Building 231 RU), including a small adjacent area associated with the Former Building 271 garage; and
- Existing Building 230 adjacent to a former railroad spur loading dock in the eastern portion of the Site (Building 230 RU) – no groundwater RU has been identified.

Implementation Team: Ryan Seelbach of the Trust will be the Remedial Project Manager responsible for implementation of the approved corrective actions. Construction Drawings and Technical Specifications (Construction Documents) accompanying this Work Plan provide additional detail regarding requirements of the Excavation Contractor (Contractor) for the excavation component of the corrective actions. The Trust will manage and implement other components of the corrective actions not related to excavation under separate contracts.

MACTEC will serve as the Trust's Construction Manager and Design Engineer, overseeing and directing all site contractors (including archaeologists) and serving as Site point-of-contact for Site visitors. MACTEC will collect confirmation samples and evaluate results, and will prepare the construction completion report that certifies construction quality assurance. MACTEC will also be responsible for outdoor cap inspection, oxygen release compound injection and effectiveness monitoring, as well as in-situ confirmation sampling at the Building 228 RU; HydroPunch sampling at the Building 230 RU; and report preparation for implementation of LUCs. A subcontractor to MACTEC will provide archaeological monitoring during excavation activities.

Treadwell & Rollo (T&R) will abandon and install wells and will perform groundwater monitoring. Erler and Kalinowski, Inc. (EKI) will perform indoor cap inspection and air/soil vapor sampling at the Building 228 RU. The Excavation Contractor (Contractor) who will perform excavation will be selected through competitive bidding.

Pre-Construction Activities

The field activities associated with the corrective actions at the five RUs is anticipated to be performed from March 2008 through December 2008. The pre-construction activities will consist of the following activities:

Pre-Construction Groundwater Monitoring: T&R will perform one round of groundwater monitoring on 11 existing wells/piezometers (selected due to prior detections of arsenic) and New Well 1 (that will be installed downgradient of the oxygen releasing compound treatment area of Building 228 RU) to assess petroleum-related chemical of concerns (COCs), arsenic, other RU-specific COCs, and associated reduction-oxidation (redox) parameters (pH, dissolved oxygen [DO], dissolved manganese, dissolved

iron, dissolved aluminum) to establish baseline conditions for COCs and redox parameters prior to remediation.

Site Preparation and Building Demolition: Prior to initiation of field remediation activities described in this Work Plan, the Trust will demolish Building 231 and remove the existing above-ground soil vapor extraction system equipment located to the southeast of Building 231.

The Contractor will set up temporary facilities such as fencing, signs, soil stockpile, and truck staging areas at the Site, and will decommission utilities (i.e., water, sewer lines, gas lines, and a 20-inch storm drain line) traversing through the excavation and as necessary, and temporarily reroute utilities around the site (i.e., reroute the sanitary sewer line around the project site to the south to the Edie Road trunk line).

The Contractor will remove a section of historic Gorgas Avenue that covers a portion of the Building 231 RU. The Contractor will remove asphalt concrete (AC) pavement within the planned excavation areas of the soil RUs, and will clear and grub vegetation from other areas as necessary.

Well Abandonment: Prior to construction, Treadwell & Rollo (T&R) will abandon 40 existing groundwater monitoring wells (within the Building 207/231 CAP Area that are not included in the CAP Groundwater Monitoring Program), and seven existing groundwater monitoring wells (within the Building 207/231 CAP Area that are included only in the CAP Pre-Construction Groundwater Monitoring Program).

Building 228 Corrective Action Implementation: Prior to initiating excavation activities, MACTEC will implement in situ injection of an oxygen releasing compound (ORC Advanced™) in the northern portion of the Building 228 RU located south of the historic wall approximately two months before excavation activities commence. In situ treatment will be implemented to enhance biodegradation of residual petroleum contamination in the saturated subsurface and mitigate potential downgradient recontamination of the other RUs. The ORC Advanced™ is expected to begin releasing oxygen immediately upon introduction into the subsurface, and continue to release oxygen for a period of approximately 18 months. MACTEC will also inspect the adjacent outdoor paved areas in the northern and southern portions of the RU, and will recommend and oversee outdoor cap improvements such as repaving.

Prior to injection of ORC Advanced™, T&R will install a monitoring well downgradient of this RU (New Well 1) and will collect groundwater samples to serve as a baseline to evaluate the effectiveness of in situ treatment. EKI will also assess potential vapor intrusion to indoor air and perform indoor air monitoring inside Building 228, and soil vapor sampling beneath the building foundation. EKI will also inspect the building foundation, and will recommend and oversee any indoor mitigation measures such as sealing the flooring and any conduits to the subsurface.

The new downgradient monitoring well that will be used to monitor the effectiveness of ORC Advanced™ in enhancing petroleum degradation will be sampled for biodegradation indicator parameters and COCs to evaluate if oxygen concentrations increase or if biodegradation bi-products are present. These indicator parameters will identify if the locally reducing environment has been (temporarily) changed into an oxidizing environment and if aerobic biodegradation is taking place. The need for additional application of oxygen releasing compound via in situ injection and/or other remedial technologies will be reevaluated if groundwater monitoring data indicates the initial application of in situ oxygen release product within the RU is not likely to reduce groundwater COCs to concentrations below cleanup levels in a timely fashion.

Construction Activities

The following sequence of execution for the RU-specific construction excavation activities is anticipated during implementation of the corrective actions for the Site.

Building 230 RU: Prior to initiation of corrective action, the Contractor will remove the water service from Gorgas Avenue (located within the 230 RU), which traverses through the excavation and provide potable water service to Building 230 by extending the water line from the south.

The Contractor will excavate soil in the vadose zone up to 5.5 feet below ground surface (bgs) adjacent to and just east of the building (COCs exceed cleanup levels between 3 and 5.5 feet bgs). The edge of the excavation parallel with the east side of Building 230 will be constructed adjacent to the loading dock on the building's east side. Following completion of excavation, the Contractor will reinstall the water service from Gorgas Avenue, backfill and repave the excavation.

Groundwater was not sampled in this area; however, saturated soils were sampled at intervals of 7.5 and 10 feet bgs, and no COCs were detected above cleanup levels within saturated soil samples. Therefore, this is the only soil RU at the Site that is not co-located with an identified Groundwater RU. MACTEC will collect two HydroPunch groundwater confirmation samples from within the Soil RU excavation after soil has been removed to assess groundwater impacts at this RU; the collected groundwater samples will be analyzed for the RU-specific COCs identified for the Soil RU, arsenic, and associated redox parameters.

Building 38 RU: Soil contamination above COCs is present in unsaturated and saturated zone soils between 1 and 10 feet bgs, and is believed to extend under the north Doyle Drive overpass structure. The Contractor will excavate soil to the south and the north of the northern Doyle Drive overpass. Contaminated soil will be left in place where excavation cannot continue under the Doyle Drive overpass structures (an LUC will be implemented for this portion of the RU until it is excavated during the eventual Doyle Drive replacement project construction). This RU will be completely backfilled and repaved to the south and revegetated with turf grass to the north of the northern Doyle overpass to match existing conditions.

Building 207 RU: The Contractor will excavate soil to depths ranging from 4 to 4.5 feet bgs. Contaminated soil will be left in place where excavation cannot continue under the Doyle Drive overpass structures (an LUC will be implemented for this portion of the RU until it is excavated during the eventual Doyle Drive replacement project construction). This RU will be completely backfilled and revegetated with turf grass to the north of the northern Doyle overpass to match existing conditions.

Building 231 RU: Prior to excavating the Building 231 RU, the Contractor will remove the water line providing fire water service to Building 230 (from west side of the building); the Contractor will provide fire water service using the line installed along the east side of Building 230.

The Contractor will excavate soil to depths ranging from 1.5 to 11 feet bgs. During excavation, the Contractor will remove underground SVE system piping and other decommissioned utilities (i.e., sewer, water, gas, 20-inch storm drain line). This RU will be backfilled and repaved after excavation and confirmation sampling is completed. Contaminated soil will remain in place where excavation cannot continue under the southern Doyle Drive overpass structure (an LUC will be implemented for this portion of the RU until it is excavated during the eventual Doyle Drive replacement project construction).

At the southern boundary of the Building 231 RU that abuts the historic wall, excavation will not be performed within 3 feet of the wall to protect the structural integrity of this historic resource. Therefore,

if based on confirmation sampling results, residual contamination in soil above cleanup levels is left in place, the Trust will implement a LUC to provide advance notice of Site conditions in the event of future ground disturbing activity, and restrict future land uses. A licensed land surveyor subcontractor by MACTEC will survey the areal extent of the LUC for depiction on a topographic site map.

The Trust, NPS, and their resource groups have identified there is value in restoring a portion of the Building 231 RU in a manner that would visually serve to acclimate the public to the appearance of below-existing-grade "natural" topography and wetlands vegetation for this area that will eventually be restored to wetlands. Therefore, the Building 231 RU, except for the Gorgas Avenue section, will be partially backfilled and rough graded to provide a suitable planting area for willows or a similar type of plant.

The partial backfilling will be conducted to minimize the surface expression of shallow groundwater, and will be graded with minimal slope (approximately 0.5 percent) to facilitate maximum storm water infiltration through the sand backfill material, minimize erosion, and provide a suitable surface for the Trust to implement their post-construction site use as a Propagule Planting Area. Drainage will be provided through the installation of a drain inlet and a storm drain pipe that discharges groundwater that may rise above the final grade (in late winter and early spring based on historic groundwater elevation data) and storm water to an existing 72-inch storm drain that traverses through the Building 231 RU. However, prior to discharging groundwater to the storm drain, MACTEC will collect one surface water sample (if and when surface expression of groundwater is observed) and test the sample for the RU-specific COCs. If COC concentrations are above the surface water criteria established for the Site, then the RU will be backfilled to historic high groundwater elevations in the area.

Additionally, the section of Gorgas Avenue within the RU will be replaced to meet National Historic Preservation Act (NHPA) requirements with a two-way road, a concrete curb, and raised pedestrian trail after excavation activities are completed.

The Former Building 271 portion of the RU contains one location where COCs were detected in soil and groundwater slightly above cleanup levels. Impacted soil in this area is likely associated with activities at the former garage. This area will be addressed by implementing a LUC in conjunction with the nearby portion of the adjacent Building 231 Area that extends under the Doyle Drive Overpass, until CalTrans removes the overpass structures and contaminated soil beneath it is removed during the planned Doyle Drive reconstruction project.

<u>*Groundwater*</u>: The approved corrective actions for the five Soil RUs are anticipated to result in eventual reduction of concentrations of COCs in groundwater to levels that are below cleanup levels at the Site. The Trust will implement a LUC for groundwater at the Site that will be discontinued when post-construction groundwater monitoring indicates corrective actions have reduced concentrations of petroleum-related COCs and arsenic below cleanup levels for four consecutive sampling events. Based on the criteria identified in the CAP, monitoring will be discontinued (subject to Regional Water Quality Control Board [Water Board] approval), the groundwater LUC will be removed, and clean closure with regard to groundwater contamination will be documented in a Site closure report. Wells will be abandoned, as applicable, upon regulatory approval. In accordance with Task 13 of Water Board Order R2-2003-0080, a Five-Year Status Report will be completed and submitted to the Water Board for approval.

<u>*Soil Confirmation Sampling and Over-Excavations*</u>: MACTEC will collect soil confirmation samples within the excavations and compare concentrations against cleanup levels. If confirmation sampling in excavations indicates cleanup levels have not been met, over-excavation and confirmation sampling will

be performed. However, the presence of physical features in portions of the Site or adjacent remediation sites will limit the lateral extent of over-excavation as follows:

- The Building 230 RU excavations will proceed laterally to remove petroleum-contaminated soil, but will be terminated if significant petroleum contamination is no longer encountered and any remaining contamination appears to be fill material associated with Fill Site 6B.

- Excavations are not anticipated to proceed underneath Halleck, Mason, or Marshall Streets. If sidewall soil confirmation samples indicate that significant petroleum-contaminated soil with COCs above cleanup levels extends underneath the roadways, the Trust will confer with stakeholders to determine if excavation underneath a roadway is warranted. Excavations will not proceed under roadways based solely on soil confirmation samples with metals, PAHs, and other non-petroleum COCs above cleanup levels in excavation sidewalls.

- Excavations will not proceed underneath the Doyle Drive overpasses. A minimum setback of 1 feet to the Doyle Drive overpasses will be maintained so that excavations do not proceed within the right-of-way or beneath the overpass structures. For the northern portion of Building 231 RU that abuts the Doyle Drive overpass, a setback of 3 feet from an existing gas line that runs parallel to the Doyle Drive overpass will be maintained. The excavations between the Southern and Northern Doyle Drive overpasses will proceed laterally to remove petroleum-contaminated soil, but will be terminated if significant petroleum contamination is no longer encountered. Any remaining soil with chemicals (e.g., metals and PAHs) above cleanup levels between and underneath the Doyle Drive overpass structures will be addressed by a LUC until CalTrans removes the overpass structures and contaminated soil beneath it is removed during the planned Doyle Drive reconstruction project.

- A setback distance of 3 feet to the Building 230 foundation will be maintained to protect its structural integrity. If confirmation sampling indicates any remaining soil with chemicals above cleanup levels adjacent to the building foundation, the Trust will implement a LUC until Building 230 is demolished and contaminated soil beneath the building is removed during the planned Quartermaster’s Reach restoration project.

- A setback distance of 5 feet to the historic walls south and west of Building 231 will be maintained. If confirmation sampling indicates any remaining soil with chemicals above cleanup levels adjacent to the historic wall south of the RU, it will be addressed under the LUC for the adjacent Building 228 RU. Any remaining soil with chemicals above cleanup levels adjacent to the wall west of the RU will be addressed by the Fill Site 6B remedy.

If excavations are terminated before cleanup levels are met, the Contractor will install a visual subsurface marker (such as a permeable geotextile material) to identify the extent of the excavation. Additionally, a licensed land surveyor subcontracted by the Contractor will survey the toe of the excavation limits (to be used to delineate LUCs).

Post-Excavation Activities

- The Contractor will remove the temporary sewer connection transferring the sewage to the Edie Road trunk line and install a new 16-inch sewer line through the 231 RU to match pre-excavation sewage infrastructure in the area.

- T&R will conduct ongoing groundwater monitoring of ten wells (four existing wells and six new replacement wells that will be installed) to verify (1) chemical concentrations are decreasing after

corrective actions are implemented, (2) chemicals in groundwater are not migrating offsite; and (3) and to assess the effectiveness of in situ injection of oxygen releasing compound at the Building 228 RU;

- MACTEC will perform erosion control monitoring of surface erosion control measures (e.g., erosion control fabric, straw wattles, etc.) placed on unpaved backfilled areas (i.e., the 231 RU, the 38 RU and the 207 RU to the north of the north Doyle Drive overpass);
- The Presidio Trust will plant willows or similar vegetation in the partially backfilled Building 231 RU;
- MACTEC, on behalf of the Trust, will file a notice of termination (NOT) under the General Permit after construction has been completed and post-construction erosion control measures have been installed;
- Two years after oxygen release compound injection has been performed, MACTEC will conduct direct push soil confirmation sampling within and outside the Building 228 RU footprint to assess the effectiveness of the injection in reducing soil and groundwater COCs below cleanup levels;
- The Trust will perform a review of protectiveness of LUC corrective actions every five years and prepare a Five-Year LUC Review Report with recommendations.

Reporting: Upon completion of the corrective actions described in this Work Plan, MACTEC will prepare a Construction Completion Report that presents a summary of the corrective action implementation and results and certifies clean closure with respect to construction quality assurance. The report will also present LUCs and their implementation.

The Trust will also prepare and submit a Five-Year Status Report to the Water Board five years after completion of corrective action completion (the first report is anticipated to be submitted in 2013) that summarizes the status of the corrective action at the Site with respect to groundwater.

1.0 INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) prepared this Corrective Action Implementation Work Plan (Work Plan) for the Building 207/231 on behalf of the Presidio Trust (Trust) to describe implementation of the corrective actions identified in the *Final Corrective Action Plan Building 207/231 Area, Presidio of San Francisco, California* (CAP; *MACTEC, 2007b*) at the Building 207/231 Area, Presidio of San Francisco, California (the Site). This Work Plan has been revised based on National Park Service (NPS) comments on the Draft Work Plan dated February 15, 2007 (*MACTEC, 2007a*); responses to NPS comments are provided in Appendix K.

As described in the CAP, the purpose of the corrective actions is to achieve “clean closure” for unrestricted re-use of the Site. The purpose of this Work Plan is to describe the plans for conducting work to implement the approved corrective actions for the five remedial units (RUs) identified in the CAP for the Site.

This Work Plan identifies the fieldwork components of implementing the corrective actions to address soil and groundwater contamination related to or co-located with releases of petroleum hydrocarbons from past uses of the Site. Construction Drawings and Technical Specifications (Construction Documents) accompanying this Work Plan provide additional detail regarding requirements of the Excavation Contractor (Contractor) for the excavation component of the corrective actions (*MACTEC, 2007c*). As described in this Work Plan, the Trust will manage and implement other components of the corrective actions not related to excavation under separate contracts.

1.1 Background

The Site comprises approximately eight acres of land located in the northeastern portion of the Presidio of San Francisco, California (Presidio), adjacent to the Crissy Marsh and bisected by the Doyle Drive/Highway 101 overpasses (Figure 1-1). Approximately 6 acres of the site is paved (from the southern boundary to the North Doyle Drive overpass) and the remaining 2 acres to the north of the North Doyle Drive overpass is unpaved.

The Site is within the Presidio of San Francisco National Historic Landmark District. Historic resources designated for preservation within the Site include several historic buildings and historic walls. Potential planned uses of the Building 207/231 Area include onsite restoration of the Quartermaster’s Reach of the adjacent Crissy Marsh and freshwater Tennessee Hollow Riparian Corridor adjacent to an historic wall in the southern portion of the Site, replacement of the Doyle Drive/Highway 101 overpasses, and continued or future use of existing buildings by tenants and preservation of historic structures.

The United States Department of the Army (Army) historically used the Site for servicing and fueling vehicles. The Site formerly contained two service/gas stations, garages, a car wash, a dry cleaning facility, and fuel oil distribution lines. The garages, car wash, underground storage tanks (USTs), and fuel lines have since been removed and the Site currently consists of buildings, paved parking areas, roadways, and some landscaping. Several utilities both in-service and abandoned pass through the Site. A below-ground 72-inch storm drain runs through the eastern portion of the Site that drains to Crissy Marsh. The southern portion of the Site contains several historic structures that will be preserved, including Building 201, Building 227, Building 228, Building 229, Building 230, and the historic walls shown on Figure 1-2.

Previous Investigations and Corrective Actions

Previous investigations conducted by the Army consisted of a Preliminary Assessment, Site Investigation, Remedial Investigation, and a Corrective Action Plan. The Trust conducted a site characterization investigation to address data gaps identified from review of results of previous investigations, and has been conducting a quarterly groundwater-monitoring program at the Site. Previous corrective actions included removal of USTs, fuel distribution system (FDS) lines, and over-excavation of associated petroleum-contaminated soils in these areas:

- FDS Section BR10-1
- USTs 207.1, 207.2, 207.3, 228.1, 228.2, 228.3, 231.1, 231.2, and 231.4 through 231.7
- Hydraulic Oil Lifts H1 through H6
- Former Building 271 Garage
- Car wash
- Sump 208.

The CAP presented the detailed results of thee previous investigations and corrective actions (*MACTEC, 2007b*).

Geologic and Hydrogeologic Conditions

The Building 207/231 Area is located at the boundary of the Northwestern and Crissy Field groundwater areas of the Marina Groundwater Basin. The Site gently slopes to the north with elevations ranging from approximately 25 to 10 feet above the Presidio lower-low water (PLLW) vertical datum (Figure 1-2).

In general, as shown on the cross-sections presented on Figures 1-3 through 1-5, unconsolidated sediments of the Colma formation underlay the Site, over which a layer of fill of variable thickness ranging up to approximately 15 feet occurs.

The main water-bearing zones in the Building 207/231 Area are the shallow, intermediate, and deep zones. These three relatively permeable, sandy, water-bearing zones are typically separated by horizons of less permeable, clayey, fine-grained estuarine deposits (Bay Mud) observed across the Crissy Field Groundwater Area.

Previous investigations indicate the upper units comprise fill and shallow sand underlain by Bay Mud in the northern part of the Site and a silt unit (likely Colma formation) in the southern part of the Site. The Bay Mud and silt units are underlain by silty sands identified as the upper and lower intermediate sand. MACTEC and Anthropological Studies Center, Sonoma State University (ASC) conduced a subsurface geoarchaeological survey in January 2006 to assess potential cultural and/or historic resources in areas planned for excavation prior to implementation of the approved corrective actions. The results of the survey are summarized in the CAP, and presented in the *Draft Subsurface Geoarchaeological Survey of the Building 207/231 Area, Presidio of San Francisco, City and County of San Francisco, California* (*ASC & MACTEC, 2006*). The subsurface geology within nine trenches excavated at the Site was generally consistent with data from previous investigations that indicate varying strata of fill, sands, silts, and clays, with some discontinuous occurrences of gravel fill containing anthropogenic material *(ASC & MACTEC, 2006)*. Cross-section Figures 1-3 through 1-5 illustrate geoarchaeological survey trenches

excavated within the Site. The lower strata of the trenches contained evidence of native soil in the form of gray fat clay, dark gray, brown, and black poorly-graded sand, and light yellowish brown poorly-graded sand. The gray fat clay typical of Bay Mud deposits was generally discontinuous at the depths excavated within the trenches.

Groundwater generally flows north in all three water-bearing zones with some minor variations in flow directions. Groundwater in the shallow groundwater zone is unconfined and groundwater flow is to the northeast. The intermediate groundwater zone consists of the intermediate/shallow sand, upper intermediate sand, and lower intermediate sand. Groundwater in the intermediate zone is semi-confined and groundwater flow is generally to the north. There is an upward vertical gradient between the intermediate and shallow groundwater zones in the northern and central portions of the Site.

Depth to groundwater across the Site varies seasonally, with depths to groundwater ranging from a low value of 8 feet bgs to a high value of 2 feet bgs; seasonal fluctuations are influenced by precipitation events and tidal influence. As illustrated on cross-sections included on Figures 1-3 through 1-5, groundwater across the site is typically present from seven to ten feet bgs. Results of groundwater monitoring indicate low groundwater levels across the Site during the end of the summer to early winter and high groundwater levels during late winter to early spring.

Groundwater monitoring data (both water levels and water quality data) indicate that the low permeable Bay Mud layer combined with the upward vertical groundwater gradient from the intermediate groundwater zone to the shallow groundwater zone have effectively mitigated downward migration of chemical contaminants. Groundwater quality data indicate reducing conditions in the shallow groundwater zone in the northern part of the Site where fill and the shallow sand are underlain by Bay Mud.

Coordination of Corrective Actions with Future Site Use

Future plans for use of the Building 207/231 Area include onsite restoration of the Quartermaster's Reach portion of the adjacent Crissy Marsh and freshwater Tennessee Hollow Riparian Corridor. In addition, there are plans to replace the Doyle Drive/Highway 101 Overpasses that extend into the northern portion of the Site, as well as continued and future use of existing buildings by tenants, and preservation of historic structures.

The CAP developed corrective action alternatives to address the following resources and planned reuses for the Site:

1. Preservation of historic Buildings 228, 229, and the historic wall in the southern portion of the Site;

2. Replacement of the Doyle Drive/Highway 101 overpasses in the northern portion of the Site; and;

3. Restoration of the Quartermaster's Reach of the adjacent Crissy Marsh and freshwater Tennessee Hollow Riparian Corridor through the Site, adjacent to the historic wall between Buildings 228 and Building 231.

1.2 Remedial Action Objectives, Cleanup Levels, and Chemicals of Concern

The Remedial Action Objectives (RAOs) identified in the CAP for the Building 207/231 Site include:

- Protection of human health and the environment;

- Cost-effective cleanup of the Site consistent with its potential land use;
- Recycling excavated materials such as concrete and asphalt to the extent practicable;
- Compliance with State and Federal environmental laws;
- Consistency of the approved corrective actions to be implemented at the Site with the overall transformation of the Presidio into a national park site; and
- Preference for permanent ("clean closure") remedies whenever practicable, cost-effective, and consistent with current or anticipated land use.

Based on these RAOs and Site data, the CAP identified cleanup levels for soil and groundwater at the Site as presented in Tables 1-1 and 1-2, respectively. For soil, the cleanup levels were divided into two categories:

- For remedial units south of and underneath the Northern Doyle Drive Overpass structure, the lowest applicable cleanup levels for protection of (1) human health residential, (2) ecological special status, (3) freshwater sediment and (4) saltwater sediment, from the CAP will be used as soil cleanup levels. For each metal, the background threshold value for Colma formation will be used as the cleanup level if it is higher than the other most stringent cleanup level. Both freshwater and saltwater sediment cleanup levels apply to these remedial units because this area is within the freshwater ecological protection zone but restoration of the Quartermaster's Reach of the adjacent Crissy Marsh is also planned for expansion in the area. Brackish water (a mixture of freshwater and saltwater) is expected. These cleanup levels apply to the Building 228 RU, Building 231 RU, Building 230 RU, the southern portion of the Building 207 RU, and the southern portion of the Building 38 RU.
- For remedial units north of the Northern Doyle Drive Overpass structure, the lowest applicable cleanup levels for protection of (1) human health residential, (2) ecological special status, and (3) saltwater sediment, from the CAP will be used as soil cleanup levels. For each metal, the background threshold value for Colma formation will be used as the cleanup level if it is higher than the other most stringent cleanup level. For sediment, only saltwater sediment cleanup levels apply to these remedial units because this area is within the saltwater ecological protection zone and is also planned for the Crissy Marsh expansion. These cleanup levels apply to the northern portion of the Building 207 RU and the northern portion of the Building 38 RU.

For groundwater, the lowest applicable cleanup levels for protection of drinking water, saltwater, and freshwater from the CAP will be used as groundwater cleanup levels.

For lead in soil, the Water Board Order R2-2003-0080 lists a cleanup level of 50 milligrams per kilogram (mg/kg) for protection of ecological terrestrial receptors. This value only applies to leaded gasoline releases and not releases from other sources including diesel and fuel oil. Therefore, for the corrective action at the Building 207/231 Area, the lead cleanup level of 50 mg/kg will only be applied if TPH as gasoline and/or benzene, toluene, ethylbenzene, xylenes (BTEX) are also detected above their respective cleanup levels. If TPH as gasoline and BTEX concentrations are below cleanup levels and there is no visual or olfactory evidence of remaining gasoline contamination, the alternate lead cleanup levels provided in Table 1-1 will be used: 82 mg/kg for RUs south of and underneath the Northern Doyle Drive overpass, and 132 mg/kg for RUs north of the Northern Doyle Drive overpass.

Site-Wide Chemicals of Concern

The remedial units (RUs) are areas where COCs were detected at concentrations exceeding cleanup levels in soil and/or groundwater shown on Figures 1-6 and 1-7 show the extent of soil and groundwater RUs. Figure 1-8 shows the associated corrective action areas. Based on the occurrence of chemicals in soil at concentrations exceeding cleanup levels, the CAP identified the following chemicals of concern (COCs) for soil:

- Petroleum hydrocarbons – Total Petroleum Hydrocarbons (TPH) as gasoline, diesel, fuel oil;
- Volatile Organic Compounds (VOCs) – benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tertiary butyl ether (MTBE), tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), bromobenzene, methylene chloride (MeCl);
- Polynuclear Aromatic Hydrocarbons (PAHs) – anthracene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene;
- Polychlorinated Biphenyls (PCBs) and Pesticides – Arochlor 1016, 4,4’-DDD; and
- Metals – arsenic, chromium, cobalt, copper, lead, mercury, silver, and zinc.

For groundwater, the CAP identified the following COCs:

- Petroleum hydrocarbons – TPH as gasoline, diesel, fuel oil;
- VOCs – BTEX, MTBE, bromobenzene, 1,2-dichlorobromine (1,2-DCB), 1,2-dichloroethane (1,2-DCA), PCE, TCE, VC;
- PAHs – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene;
- PCBs – Arochlor 1016; and
- Metals – arsenic, lead, nickel, vanadium, and zinc.

In 2006, the Trust conducted a study to further evaluate the presence of arsenic in groundwater and its relationship to petroleum hydrocarbons, soil types, and groundwater chemistry at the Building 207/231 Area, and two neighboring CAP sites—the Building 1065 Area and the Commissary/PX Area—as presented in the *Technical Memorandum, Evaluation of Arsenic and Other Metals in Groundwater at Three Corrective Action Plan Sites, Presidio of San Francisco, California* (*MACTEC, 2006a*). Based on the results of the study, elevated dissolved arsenic concentrations in groundwater at the Site are likely the result of geochemical changes caused by locally reducing conditions from degradation of petroleum hydrocarbons in the shallow groundwater zone, and to a lesser extent from degradation of organic matter in the Bay Mud underlying the Site. Consequently, corrective actions for the Site include groundwater monitoring for arsenic.

1.3 Project Team Responsibilities

Key project team members include the Trust as Owner, MACTEC as the Construction Manager, and the contractors that will implement the corrective actions identified on Figure 1-9, as well as the project team

members including the Water Board, NPS, Department of Toxic Substances Control (DTSC), and Presidio Restoration Advisory Board (RAB). Table 1-3 describes the responsibilities of the project team in implementing the pre-construction, construction, and post-construction corrective action activities that are described in detail in Section 3.0. Table 1-4 presents the key points of contact on the project team.

For this project:

- Ryan Seelbach of the Trust is the Remedial Project Manager responsible for implementation of the approved corrective actions.
- Brian Ullensvang, P.E. is the NPS Remediation Manager and will coordinate with NPS specialists during project planning and corrective action activities.
- Ramkishore Rao (MACTEC) is the Professional Engineer (P.E.) and design engineer for the project. MACTEC's Construction Manager to be identified for the project will be responsible for providing weekly construction reports, which will include field and laboratory documentation from the previous week. Stacy Sabol is MACTEC's project manager for the project. MACTEC will also collect confirmation samples and evaluate results, and will prepare the Construction Completion Report that certifies Construction Quality Assurance (CQA). MACTEC will perform ORC Advanced^{TM} injection and effectiveness monitoring and outdoor cap inspection at the Building 228 RU, report preparation for implementation of LUCs, in-situ HydroPunch sampling at Building 230 RU, and in-situ confirmation sampling at Building 228 RU.
- T&R will abandon and install wells and will perform groundwater monitoring.
- EKI will conduct the indoor cap investigation and indoor air/soil vapor sampling.
- The Excavation Contractor (referred to as "Contractor"; to be selected), who will perform excavation will be determined after the Trust's excavation bidding and procurement process is completed.
- Archaeologists subcontracted by MACTEC will perform archaeological monitoring for the Site.
- Drillers subcontracted by MACTEC, EKI, and T&R will perform in situ injection and sampling, sub-cap soil vapor sampling, and well installation and abandonment for the Site, respectively.

1.4 Corrective Action Contracting

This section identifies the contracting involved in the implementation of each corrective action component. Details related to implementation of these corrective actions, including schedules, contracting, and reporting requirements and responsibilities are described in Sections 2.0 through 6.0 .

The Trust will procure the contractors, and the Construction Manager (MACTEC) will manage the Trust's contractors to implement the corrective actions as shown on Figure 1-9 and summarized below:

- <u>MACTEC</u>: Design Engineer, Construction Manager, Building 228 RU Oxygen Releasing Compound Injection Contractor and Outdoor Cap Inspection Contractor, Land Use Control Contractor, and In Situ Sampling Contractor;
- <u>EKI:</u> Building 228 Indoor Cap Corrective Action Contractor;
- <u>T&R:</u> Groundwater Monitoring and Well Abandonment/Installation Contractor; and

- Excavation Contractor (Contractor): To be Determined.

Demolition of Building 231 and the aboveground SVE equipment will be completed prior to initiation of the corrective actions proposed in this Work Plan. Therefore, the demolition scope is excluded from this Work Plan.

The accompanying Construction Documents provide additional detail regarding requirements of the Excavation Contractor for the excavation component of the corrective actions (*MACTEC, 2007c*). As described in this Work Plan, the Trust will manage and implement other components of the corrective actions not related to excavation under separate contracts.

2.0 CORRECTIVE ACTIONS

This section summarizes the remedial units identified and approved corrective actions selected for implementation in the CAP (*MACTEC, 2007b*).

The remedial units (RUs) are areas where COCs were detected at concentrations exceeding cleanup levels in soil and/or groundwater shown on Figures 1-6 and 1-7. Based on the occurrence of COCs at concentrations exceeding cleanup levels, the CAP identified the following five soil RUs and four co-located groundwater RUs at the Site:

<u>Southern Portion of Site Behind the Historic Wall:</u>

1. Existing Building 228 adjacent to the historic wall and former USTs and former fuel distribution lines (FDSs) in the southern portion of the Site (Building 228 RU).

<u>Northern and Central Portions of Site</u>:

2. Former Building 207 fueling station and adjacent Former Building 208 sump in the northern portion of the Site (Former Building 207 RU);

3. Former Buildings 38, 38-A, and garage oil station in the northeastern portion of the Site (Former Building 38 RU);

4. Existing Building 231 and former service station complex in the central part of the Site (Building 231 RU), including a small adjacent area associated with the Former Building 271 garage; and

5. Existing Building 230 adjacent to a former railroad spur loading dock in the eastern portion of the Site (Building 230 RU [Groundwater was not sampled in this area; however, saturated soils were sampled at intervals of 7.5 and 10 feet bgs, and no COCs were detected above cleanup levels within saturated soil samples. Therefore, this is the only soil RU at the Site that is not co-located with an identified Groundwater RU.]).

The corrective actions selected for the RUs differ according to the portion of the Site where they are located as follows:

- ***Corrective Actions for Southern Portion of Site Behind Historic Wall:*** The approved corrective action for the Building 228 RU that occurs in the southern portion of the Site, consists of in situ injection of an oxygen releasing compound (ORC Advanced™) to stimulate biodegradation of residual petroleum hydrocarbons in the saturated zone of the subsurface in the northern portion of the RU; inspection of the existing indoor cap (building foundation) and outdoor cap (paved areas) in the northern and southern portions of the RU, and improvements and maintenance, as necessary; assessment of vapor intrusion to indoor air through the collection of sub-cap soil vapor samples and indoor air monitoring; groundwater monitoring; and a land use control (LUC). This corrective action was selected because residual contamination is present between the historic building and wall, and source removal by excavation will not be implemented to prevent potential damage to adjacent historic structures that are important cultural resources designated for preservation.

- ***Corrective Actions for Northern and Central Portions of Site:*** The approved corrective action for the four RUs that occur in the northern and central portions of the Site—Former Building 207 RU,

Former Building 38 RU, Building 231 RU, and Building 230 RU—consists of removing petroleum-contaminated soil that is considered to be the source of contamination to groundwater to achieve clean closure for unrestricted reuse. This will be achieved through excavation and offsite disposal of contaminated soils and backfill with natural sands, followed by downgradient groundwater monitoring to confirm source removal has reduced impacts to groundwater.

Figures 1-6 and 1-7 shows the RUs defined in the CAP. Figure 1-8 shows the associated corrective action areas (i.e., excavation areas and LUC areas). To facilitate implementation of the CAP remedy and to maximize removal of contaminated soils, MACTEC made the following minor adjustments to the LUC and assumed excavation boundaries (shown on Figure 1-8) from those presented in the CAP figures:

<u>Excavation Areas</u>

- The Construction Drawings included in the accompanying Construction Documents (*MACTEC, 2007c)* square off the rounded portions of the CAP RU boundaries within assumed excavation areas to incorporate known locations where concentrations of COCs in soil exceed cleanup levels (as described in Section 2.1 below) and facilitate constructability. The Contractor will stockpile soil removed from the assumed excavation areas for characterization and offsite disposal and will not segregate clean from impacted soil.

- These areas also include the nine geoarchaeological trench locations (as described in Section 1.1) from which the Contractor will excavate and dispose trench backfill material offsite because valid analytical data was not available to confirm the backfill material did not contain concentrations COCs above cleanup levels (*ASC & MACTEC, 2006b*). The Contractor will stockpile soil removed from the trenches for characterization and offsite disposal, and will not segregate potentially uncontaminated (‘clean’) from contaminated soil.

<u>LUC Areas</u>

- The Construction Drawings included in the accompanying Construction Documents (*MACTEC, 2007c)* square off portions of the CAP RU boundaries within LUC areas to incorporate known locations where concentrations of COCs in soil exceed cleanup levels (as described in Section 2.1 below) that will not be excavated due to the presence of adjacent structures that are either: (1) historic and designated for preservation; or (2) occur beneath or directly adjacent to the overpass structure beneath Doyle Drive that will be excavated in the future under the Doyle Drive reconstruction project. Following completion of excavation, the licensed land surveyor subcontracted by the Contractor will survey the toes of excavations adjacent to the physical features that preclude excavation to delineate the limits of excavation adjacent to these structures for use in depicting the LUCs on areal topographic maps.

2.1 Summary of Remedial Units and Corrective Actions

The following sections summarize the five soil RUs and four groundwater RUs and corrective actions identified in the CAP, and provides a detailed description of each of the corrective action components for the Site that consist of:

- Source removal by excavation of contaminated soils and offsite disposal from the Building 230, Former Building 38, Former Building 207, and Building 231 RUs;

- Backfilling excavations with naturally derived sand;

- At the Building 228 RU where source removal by excavation will not be implemented to prevent potential damage to adjacent historic structures that will be preserved: (a) in-situ treatment of saturated soils and groundwater; (b) implementation of an LUC for residual soil and groundwater contamination; (c) assessment of potential vapor intrusion to indoor air within historic buildings in the LUC area; (d) indoor and outdoor cap inspection and improvements as necessary; and (e) long term maintenance and management of the cap and LUC area;

- Groundwater monitoring, well abandonment, and new well installation;

- Implementation of LUCs for areas of residual contamination as follows: (a) a temporary LUC for soil beneath structures that will be lifted when clean closure is achieved after future site activities remove these structures to access and excavate contaminated soils; and (b) an LUC for groundwater that will be lifted when clean closure is achieved after cleanup levels have been met under the post-construction groundwater monitoring program.

Figure 2-1 presents the historic high groundwater elevations at the Site. Figures 2-2A and 2-2B present the planned excavation areas for the RUs.

2.1.1 Building 228 Remedial Unit Corrective Action

This RU is located on the south side of the project area on the north and south sides of Historic Building 228 as shown on Figure 1-2. The impacted soil at this area is co-located with impacted groundwater in the northern portion of the RU associated with the former Building 228 USTs.

Remedial Unit

- <u>Northern Building 228 RU</u>: This portion of the RU occurs between the northern edge of the Building 228 foundation and the historic wall, and extends just beneath the wall. The impacted soil in the northern portion of this RU is located in unsaturated and saturated soil between 1 to 11 feet bgs. Figure 1-6 shows COCs detected in soil and groundwater at concentrations that exceed cleanup levels in this RU.

- <u>Southern Building 228 RU</u>: This portion of the RU occurs outside the southeastern edge of the Building 228 foundation, and extends beneath the foundation corner. Impacted soil in the southern area of this RU is located within the former excavation associated with the FDS lines, and is located immediately adjacent to the south side of the historic Building 228. Soil contamination is located in vadose zone soil at a depth of 6 feet bgs. Figure 1-6 shows COCs detected in soil at concentrations that exceed cleanup levels in this RU.

Summary of Corrective Action

- <u>Northern Building 228 RU</u>: This portion of the RU occurs between the northern edge of the Building 228 foundation and the historic wall, and extends just beneath the wall. Details of the corrective action are summarized in Section 3.1.7 and presented in Appendix E (Oxygen Releasing Compound Injection, Northern Portion of Building 22 Remedial Unit) and Appendix H (Indoor Cap Inspection and Air/Soil Vapor Sampling, Building 228 Remedial Unit). MACTEC will perform in-situ injection of an oxygen releasing compound in this area to enhance biodegradation of residual petroleum-contaminated saturated soils and groundwater in a manner that will not endanger the historic structures (Building 228 and the wall). Figure E-1 of Appendix E shows the injection area. This area has several utilities crossing its boundaries including a fire hydrant on the west side, and natural gas

and power on the north side of the existing building. There are also overhead power lines located within the area.

- Southern Building 228 RU: This portion of the RU is paved and is located outside the southeastern edge of the Building 228 foundation, and extends beneath the foundation corner. The Trust will implement a LUC in this portion of the RU because COC concentrations were detected above cleanup levels in this area that (1) are not anticipated to be able to be removed by excavation without endangering the structural integrity of the building foundation, and (2) are heavy hydrocarbons (e.g., TPH as fuel oil and TPH as diesel) that occur in unsaturated soils that are not treatable via in-situ methods. Figure 1-8 shows the LUC area.

2.1.2 Building 230 Remedial Unit Corrective Action

The planned excavation area is located on the east side of the project site. The boundaries are within the asphalt paved parking lot on the east side of existing historic Building 230 as shown on Figure 1-2. The only known utility to cross the area is a water line running north / south through the area. An abandoned railroad spur and associated debris may exist within the excavation area.

Remedial Unit

Impacted soil in this area is associated with railroad activities conducted east of existing Building 230, which includes a portion of the railroad spur. COCs above cleanup levels occur in vadose zone soils between 3 to 5.5 feet bgs adjacent to and just east of the building. The COCs that were detected in soil at concentrations above cleanup levels are shown on Figure 1-7.

Groundwater was not sampled in this area; however, saturated soils were sampled at intervals of 7.5 and 10 feet bgs, and no COCs were detected above cleanup levels within saturated soil samples. Therefore, this is the only soil RU at the Site that is not co-located with an identified Groundwater RU.

Summary of Corrective Action

Prior to initiation of corrective action, the Contractor will remove the water service from Gorgas Avenue, which traverses through the excavation (and located to the east of Building 230) and provides portable water service to Building 230 by extending the water line from the south.

The corrective action implementation for this RU is excavation and offsite disposal of soil; backfilling the excavation with naturally derived sand; and groundwater monitoring. The Contractor will excavate contaminated soil (including geoarchaeological trench backfill materials) and dispose of excavated material offsite at a Trust-approved disposal facility. Backfilling, grading, and restoration activities are described in Section 3.2.8. Following completion of excavation, the Contractor will reinstall water service from Gorgas Avenue.

Because groundwater associated with this RU has not been sampled, MACTEC will collect two HydroPunch samples following completion of excavation and prior to backfilling this RU to verify COCs detected in saturated soils above cleanup levels have not impacted groundwater. Saturated soil is between approximately 2 and 3 feet bgs in this area based on the cross-section shown on Figure 1-4. The cross-section shown on Figure 1-4 also suggests the top of Bay Mud will be encountered between 3 and 4 feet bgs.

The Contractor will excavate, stockpile, characterize, and dispose offsite geoarchaeological trench backfill material from the trench shown on Figure 1-8 because valid analytical data was not available to

confirm the backfill material did not contain concentrations COCs above cleanup levels (*ASC & MACTEC, 2006*).

The Contractor will excavate Building 230 RU vertically to a depth of approximately 6.5 feet bgs and potentially deeper to remove known COCs in soil until soil confirmation sampling results for all COCs indicate that cleanup levels are met within the excavation bottom as described in Appendix I (Confirmation Sampling Plan). The Contractor will not segregate clean from impacted soil. The horizontal limits of the excavation are discussed below in Section 2.1.6.

2.1.3 Former Building 38, 38-A, and Garage Area Remedial Unit Corrective Action

The northern Doyle Drive/Highway 101 Overpass bisects the excavation area for this RU. The planned excavation north of the overpass is located in a lightly vegetated area (turf grass) as shown on Figure 1-2. The excavation south of the overpass is in a level asphalt paved area and no known utilities traverse through the planned excavation.

Remedial Unit

The impacted soil in this area is co-located with impacted groundwater associated with use of the former Building 38, 38-A, and garage areas. The impacted soil is located beneath and around the former garage in unsaturated and saturated zone soils between 1 and 10 feet bgs. Figure 1-6 shows COCs detected in soil and groundwater at concentrations above cleanup levels.

Summary of Corrective Action

The corrective action implementation for this RU is excavation and offsite disposal of soil; backfilling the excavation with naturally derived sand; and groundwater monitoring. The Contractor will excavate contaminated soil (including geoarchaeological trench backfill materials) and dispose of excavated material offsite at a Trust-approved disposal facility. Backfilling, grading, and restoration activities are described in Section 3.2.8.

Saturated soil is between approximately 7 to 8 feet bgs in this area based on soil boring data. Soil boring data from this area also suggests the top of Bay Mud is between 3 and 8 feet bgs. There are no shallow groundwater zone monitoring wells in the immediate vicinity of this RU.

<u>Geoarchaeological trench backfill</u>: The Contractor will excavate, stockpile, characterize, and dispose offsite geoarchaeological trench backfill material from the trench shown on Figure 1-8 because valid analytical data was not available to confirm that the backfill material did not contain concentrations of COCs above cleanup levels (*ASC & MACTEC, 2006b*). All of the geoarchaeological trench backfill material will be disposed offsite.

<u>Excavation</u>: The vertical depth of excavation shall be approximately 11 feet bgs or deeper to remove known COCs above cleanup levels until soil confirmation sampling results for COCs indicate that cleanup levels are met within the excavation bottom as described in Appendix I (Confirmation Sampling Plan). The horizontal limits of the excavation are discussed below in Section 2.1.6.

2.1.4 Former Building 207 Remedial Unit (Including Former Building 208 Sump Area) Corrective Action

The former Building 207 RU is located on the north side of the project area and includes the former Building 207 area and the former Building 208 Sump area as shown on Figure 1-2.

The former Building 207 area is on the north side of the northern Doyle Drive/Highway 101 Overpass. The surface of this area contains light vegetation (turf grass and weeds) and is bounded to the north by Old Mason Street, to the west by Halleck Street, and to the south by the overpass. A below grade communication line conduit and several irrigation lines cross the excavation. A street light is located just outside the northwest corner of the planned excavation.

The former Building 208 Sump area is between the northern and southern Doyle Drive/Highway 101 overpasses. The planned excavation area is at level grade and is paved with asphalt concrete (AC).

The two areas of soil contamination in this RU are co-located with an area of groundwater contamination associated with the former Building 207 USTs.

Remedial Unit

The majority of soil containing COCs above cleanup levels in the Building 207 area is located in the vadose zone from 3 to 3.5 feet bgs. This area includes low temperature thermal desorption (LTTD) material the Army used to backfill an historical excavation associated with the removal of USTs in this area. The LTTD material contains COCs above saltwater and freshwater protection zone cleanup levels for the Site. The COCs that were detected in soil and groundwater at concentrations above cleanup levels in this location are shown on Figure 1-6.

Soil containing COCs above cleanup levels associated with the former Building 208 sump is located in saturated soil from 5 to 7.5 feet bgs. The COCs that were detected in groundwater at concentrations above cleanup levels at this area occur in the shallow aquifer at typical depths ranging from 7 to 16 feet bgs.

Summary of Corrective Action

The corrective action implementation for this RU is: excavation and offsite disposal of soil (including LTTD material); backfilling the excavation with naturally derived sand; and groundwater monitoring. The Contractor will excavate contaminated soil (including geoarchaeological trench backfill materials) and dispose of excavated material offsite at a Trust-approved disposal facility. Backfilling, grading, and restoration activities are described in Section 3.2.8.

For the Former Building 207 portion of the RU, saturated soil is at about 5 feet bgs in this area based on an historical high groundwater elevation monitored in nearby shallow zone groundwater monitoring well 231GW16 shown on Figure 2-1. The cross-sections shown on Figures 1-3 and 1-5 suggest the top of Bay Mud is between approximately 8 and 17 feet bgs within the RU. For the Former Building 208 Sump portion of the RU, saturated soil is approximately 5 feet bgs in this area based on the cross-section shown on Figure 1-3. The cross-section shown on Figure 1-3 also suggests the top of Bay Mud is between 8 and 9 feet bgs.

<u>Removal of LTTD and archaeological trench backfill materials</u>: The Contractor will notify the Construction Manager upon encountering LTTD material (observation of materials typically of a dark grey granular material with low organic content, with geotextile fabric and gravel backfill marking the

LTTD material interface) within excavations so that its location, extent, and offsite disposal can be recorded and managed in accordance with the *Low Temperature Thermal Desorption-Treated Soil Tracking and Management Plan* (Plan; *EKI, 2004*) and requirements of Water Board Order R2-2003-0080. In addition to the LTTD treated soil within the former excavation, the Contractor will excavate and dispose offsite geoarchaeological trench backfill material from the trench shown on Figure 1-5 because valid analytical data was not available to confirm the backfill material did not contain concentrations COCs above cleanup levels (*ASC & MACTEC, 2006b*). The Contractor will stockpile soil removed from the excavation areas, LTTD material, and geoarchaeological trench backfill for characterization and offsite disposal and will not segregate clean from impacted soil.

<u>Excavation</u>: The Contractor will excavate Former Building 207 RU vertically to approximately 12 feet bgs to remove LTTD soil, and the Former Building 208 Sump Area vertically to approximately 7.5 feet bgs or deeper to remove known COCs above cleanup levels until soil confirmation sampling results for all COCs indicate that cleanup levels are met within the excavation bottom as described in Appendix I (Confirmation Sampling Plan). The horizontal limits of the excavation are discussed below in Section 2.1.6.

2.1.5 Building 231 Remedial Unit (Including Former Building 271 Area) Corrective Action

This RU is located in the central portion of the project area, and includes the former Building 271 area as shown on Figure 1-2. To the north, this RU is adjacent to and extends under the southern Doyle Drive/Highway 101 Overpass structure. To the south, this RU abuts the historic wall just north of the Building 228 RU. A variety of utilities including water, storm drain, electric, sewer, communications, and natural gas run through the planned excavation area. Existing Building 231 is located within the planned excavation limits, and will be demolished prior to implementation of corrective action activity described in this Work Plan. The entire area is asphalt or concrete paved and slopes approximately 1.5 percent from southwest to northeast with Gorgas Avenue crossing the north side of the RU.

Remedial Unit

The impacted soil in the Building 231 area is co-located with impacted groundwater associated with the former Building 231 USTs. The impacted soil is located in unsaturated and saturated zone soils between 0.5 to 10 feet bgs. The co-located impacted shallow groundwater occurs at depths ranging from 8 to 24 feet bgs. The Former Building 271 area contained a garage at the north end of the building. This area contains one location where COCs were detected in soil and groundwater slightly above cleanup levels.

The COCs that were detected in soil and groundwater at concentrations above cleanup levels are shown on Figure 1-7.

Summary of Corrective Action

Prior to excavating the Building 231, the Contractor will remove the water line providing fire water service to Building 230 (from west side of the building), the Contractor will provide fire water service from the line installed along the east side of Building 230.

The corrective action implementation for the Building 231 RU is: excavation and offsite disposal of soil; backfilling the excavation with Trust-approved imported fill materials consisting of naturally derived sand and smaller sized fractions; and groundwater monitoring. The Contractor will excavate contaminated soil (including geoarchaeological trench backfill materials) and dispose of excavated material offsite at a

Trust-approved disposal facility. Backfilling, grading, and restoration activities are described in Section 3.2.8.

Prior to excavation, the Contractor will demolish Building 231 and remove the existing aboveground soil vapor extraction system equipment located to the southeast of Building 231. The Contractor will then excavate contaminated soil (including geoarchaeological trench backfill materials) and dispose of excavated material offsite at a Trust-approved disposal facility.

Saturated soil is near the ground surface to approximately 6.8 feet bgs in this area based on (1) historical high groundwater elevations measured in shallow groundwater monitoring wells within the Building 231 RU, and (2) reports of groundwater expression in a catch basin within Building 231. The cross-sections shown on Figures 1-3 and 1-4 suggest the top of Bay Mud is between 1.5 feet bgs and 12 feet bgs within the RU.

<u>Excavation of geoarchaeological trench backfill material</u>: The Contractor will excavate, stockpile for characterization, and dispose offsite from the trench shown on Figure 1-8 because valid analytical data was not available to confirm the backfill material did not contain concentrations COCs above cleanup levels (*ASC & MACTEC, 2006b*). Clean soil will not be segregated from impacted soil.

<u>Excavation</u>: The Contractor will excavate Building 231 RU to approximately 6 to 13 feet bgs or deeper (to elevations of approximately 4 to 5 feet NAVD 88 or deeper) to remove known COCs above cleanup levels until soil confirmation sampling results for all COCs indicate that cleanup levels are met within the excavation bottom as described in Appendix I (Confirmation Sampling Plan). The horizontal limits of the excavation are discussed below in Section 2.1.6.

2.1.6 Horizontal Limits of Excavations

The Contractor will excavate within the four excavation RUs (Building 230 RU, 38 RU, 207 RU, and 231 RU) to the initial perimeters shown on Figures 2-2A and 2-2B. Sidewall soil confirmation samples will be collected to determine if lateral over-excavation is required to remove COCs above cleanup levels. The presence of physical features in portions of the Site or adjacent remediation sites will limit the lateral extent of over-excavation as follows.

Fill Site 6B borders and overlaps with the Building 207/231 Area to the south and east and will constrain excavations. The Trust is currently investigating Fill Site 6B to determine the edges of contaminated fill in the area (*Trust, 2007*). The contaminated fill associated with Fill Site 6B may extend beyond the current Fill Site 6B site boundaries identified on Figure 2-2B. Therefore, for the Building 207/231 Area RUs, the excavations will proceed laterally to remove petroleum-contaminated soil, but will be terminated if significant petroleum contamination is no longer encountered and any remaining contamination appears to be fill material associated with Fill Site 6B. The Fill Site 6B boundaries will be adjusted based on the final Building 207/231 Area excavation limits, as necessary.

During excavation activities, the determination of significant petroleum-contaminated soil associated with Building 207/231 Area releases versus contaminated fill associated with Fill Site 6B will be made by comparing soil confirmation sample data with Fill Site 6B soil data, visual and olfactory evidence, and threat to underlying groundwater quality (i.e., if concentrations exceed Water Board Order cleanup levels for groundwater quality). The primary contaminants detected in fill soil above cleanup levels at Fill Site 6B to-date include metals, PAHs, and pesticides. TPH as motor oil and diesel concentrations have typically ranged from 10 to 250 mg/kg, but have been detected as high as 780 mg/kg in Fill Site 6B soil. TPH as gasoline has only been detected once at a low concentration and VOCs have not been detected in

Fill Site 6B soil (*Trust, 2007*). If sidewall confirmation samples indicate significant petroleum-contaminated soil with COCs above cleanup levels, the Trust will confer with Stakeholders to determine if further excavation is warranted.

The major physical features in the area that will restrict lateral over-excavation include Halleck Street, Mason Street, Marshall Street, the Northern and Southern Doyle Drive overpasses, the historic walls, and Building 230. In general, the following rules will apply to the excavations to restrict lateral over-excavations at physical features:

- Excavations are not anticipated proceed underneath Halleck, Mason, or Marshall Streets. Based on soil data collected along the edges of these streets, it is unlikely that contaminated soil extends underneath these roadways. If sidewall soil confirmation samples indicate that significant petroleum-contaminated soil with COCs above cleanup levels extends underneath the roadways, the Trust will confer with stakeholders to determine if excavation underneath a roadway is warranted. Excavations will not proceed under roadways based solely on soil confirmation samples with metals, PAHs, and other non-petroleum COCs above cleanup levels in excavation sidewalls.

- Excavations will not proceed underneath the Doyle Drive overpasses. A setback of 1 feet to the Doyle Drive overpasses will be maintained so that excavations do not proceed within the right-of-way or beneath the overpass structures. For the northern portion of Building 231 RU that abuts the Doyle Drive overpass, a setback of 3 feet from an existing gas line that runs parallel to the Doyle Drive overpass will be maintained. The excavations between the Southern and Northern Doyle Drive overpasses will proceed laterally to remove petroleum-contaminated soil, but will be terminated if significant petroleum contamination is no longer encountered. Any remaining soil with chemicals (e.g., metals and PAHs) above cleanup levels between and underneath the Doyle Drive overpass structures will be addressed by a LUC until CalTrans removes the overpass structures and contaminated soil beneath it is removed during the planned Doyle Drive reconstruction project.

- A setback distance of 3 feet to the Building 230 foundation will be maintained to protect its structural integrity. The Trust will implement a LUC until Building 230 is demolished and contaminated soil beneath the building is removed during the planned Quartermaster's Reach restoration project.

- A setback distance of 5 feet to the historic wall south and west of Building 231 will be maintained. Any remaining soil with chemicals above cleanup levels adjacent to the wall will be addressed by the LUC for the Building 228 RU.

If excavations are terminated before cleanup levels are met, the Contractor will install a visual subsurface marker (such as a permeable geotextile material) to identify the extent of the excavation. Additionally, a licensed land surveyor subcontracted by the Contractor will survey the toe of the excavation limits (to be used to delineate LUC areas).

The following sections present the horizontal limits of the excavations for each specific RU.

2.1.6.1 Excavations South of Doyle Drive (Building 231 RU and Building 230 RU)

The Contractor will excavate within the Building 231 RU and Building 230 RU to the initial perimeters shown on Figure 2-2B. These two excavations are constrained by the Southern Doyle Drive overpass to the north; Fill Site 6B to the north, south, and east; Halleck street to the west; as well as Building 230 and the historic walls.

- Excavation Limits to the North – The Contractor will excavate VOCs and significant petroleum-contaminated soil to the north as necessary up to the Southern Doyle Drive overpass. If significant petroleum contamination is no longer encountered and any remaining contamination appears to be fill material associated with Fill Site 6B, the excavation will be terminated. It is unlikely that the excavations will proceed underneath Gorgas Ave., except where initially planned for the Building 231 RU, unless significant petroleum contamination extends underneath the roadway.

- Excavation Limits to the South and East – The Contractor will excavate VOCs and significant petroleum-contaminated soil to the south and east as necessary. If significant petroleum contamination is no longer encountered and any remaining contamination appears to be fill material associated with Fill Site 6B, the excavation will be terminated.

- Excavation Limits to the West – The Contractor will excavate VOCs and significant petroleum-contaminated soil to the west within the Building 231 RU excavation as necessary up to the eastern edge of Halleck Street. Previous data collected along the eastern edge of Halleck Street indicate that the contamination does not likely cross under Halleck Street (i.e., only one sample at MT-1 collected in December 1988 showed benzene above the cleanup level).

- Building 230 – The Contractor will excavate VOCs and significant petroleum-contaminated soil around Building 230 as necessary. However, the Contractor will excavate to within only 3 feet from the Building 230 foundation to protect its structural integrity.

- Historic Wall – For the southwestern edge of the Building 231 RU excavation, the excavation can only continue up to the historic wall. A setback of 5 feet to the historic wall will be maintained.

2.1.6.2 Excavations Between Doyle Drive Overpasses (Portions of Building 207 RU and Building 38 RU)

The Contractor will excavate within the Building 207 RU and Building 38 RU to the initial perimeters shown on Figure 2-2A. These two excavations between the Doyle Drive overpasses are constrained by the Northern Doyle Drive overpass to the north; Southern Doyle Drive overpass to the south; Marshall Street to the east; and Halleck Street to the west.

- Excavation Limits to the North and South – The Contractor will excavate significant petroleum-contaminated soil as necessary to the north and south up to the Doyle Drive overpasses. If significant petroleum contamination is no longer encountered, the Contractor will terminate the excavations before Doyle Drive. (Any remaining soil with COCs (e.g., metals and PAHs) above cleanup levels between and underneath the Doyle Drive overpass structures will be addressed by an LUC until CalTrans removes the overpass structures and the contaminated soil beneath it is removed during the planned Doyle Drive reconstruction project).

- Excavation Limits to the West and East – The Contractor will excavate significant petroleum-contaminated soil as necessary to the west and east up to the edges of Halleck and Marshall Streets, respectively. If significant petroleum contamination is no longer encountered, the Contractor will terminate the excavations before the roadways.

2.1.6.3 Excavations North of Doyle Drive Overpasses (Portions of Building 207 RU and Building 38 RU)

The Contractor will excavate within the Building 207 RU and Building 38 RU to the initial perimeters shown on Figure 2-2A. These two excavations north of Doyle Drive are constrained by Mason Street to the north; the Northern Doyle Drive overpass to the south; Marshall Street to the east; and Halleck Street to the west.

- Excavation Limits to the North – The Contractor will excavate contaminated soil as necessary to the north up to the southern edge of Mason Street. If cleanup levels for all COCs are achieved, the Contractor will terminate the excavations before Mason Street. Previous data collected in this area indicate that the contamination does not likely cross under Mason Street. For the area directly north of the Building 207 RU, the Army previously excavated under Mason Street; therefore, contaminated soil does not cross under Mason Street at this RU.

- Excavation Limits to the South – The two excavations are constrained by the Northern Doyle Drive overpass to the south. The Contractor will excavate contaminated soil to the south as necessary up to the Northern Doyle Drive overpass. If cleanup levels for all COCs are achieved, the Contractor will terminate the excavations before Doyle Drive.

- Excavation Limits to the North and South – The Contractor will excavate significant petroleum-contaminated soil as necessary to the north and south up to the Doyle Drive overpasses. If significant petroleum contamination is no longer encountered, the Contractor will terminate the excavations before Doyle Drive. (Any remaining soil with COCs (e.g., metals and PAHs) above cleanup levels between and underneath the Doyle Drive overpass structures will be addressed by an LUC until CalTrans removes the overpass structures and the contaminated soil beneath it is removed during the planned Doyle Drive reconstruction project).

- Excavation Limits to the West and East – The Contractor will excavate contaminated soil as necessary to the west and east up to the edges of Halleck and Marshall Streets, respectively. If cleanup levels for all COCs are achieved, the Contractor will terminate the excavations before the roadways.

2.1.7 Pre- and Post-Construction Groundwater Monitoring

The approved corrective action for the Building 207/231 Area consists of groundwater monitoring for arsenic, petroleum related constituents, and other RU related COCs for the site-wide monitoring well network that includes downgradient wells in the vicinity of each RU. T&R will perform pre- and post-construction groundwater monitoring using a network of upgradient, crossgradient, and downgradient wells for COCs during the pre-construction and post-construction phases of the project (see Figure 1-8 for well locations).

Groundwater monitoring will continue in a monitoring well until all COCs are consistently below cleanup levels for four consecutive monitoring events to (1) verify that contaminant concentrations are decreasing, and (2) that contaminants in groundwater are not migrating offsite. After all concentrations of petroleum-related COCs and arsenic in groundwater have been demonstrated to be below cleanup levels for four consecutive monitoring events in a monitoring well, monitoring will be discontinued in that monitoring well (subject to Water Board approval) and clean closure with regard to groundwater contamination will be documented in a site closure report. 231 GW-09, located upgradient of the RUs, will continue to be

monitored until the COC concentrations in all the monitoring wells included in the post-construction groundwater monitoring for the site are below cleanup levels.

A groundwater monitoring plan, which includes a description of the well locations to be monitored, COCs and other parameters that groundwater samples will be analyzed for, frequency of monitoring, and the duration of the monitoring program is presented in Section 3.3.6.

2.1.8 Land Use Controls

The Trust will implement an LUC for residual contamination in soil or groundwater associated with the following RUs that contain concentrations of COCs above cleanup levels, as shown on Figure 1-8:

- The Building 228 RU, including the northern portion of the Soil RU and Groundwater RU located between historic Building 228 and the historic wall, and the southern portion of the Soil RU adjacent to the southeastern corner of Building 228. The portion of the Building 228 LUC associated with the northern portion of the Soil RU and Groundwater RU may be discontinued if post-injection in situ soil and groundwater confirmation sampling and downgradient groundwater monitoring indicates corrective actions have reduced concentrations of RU-related COCs in soil and groundwater below cleanup levels for four consecutive sampling events as described in Section 2.1.7.

- Portions of the Building 38 Soil RU and Building 231 (including Former Building 271) Soil RU that are adjacent to or extend beneath the Doyle Drive overpass structures identified in Sections 2.1.3 and 2.1.5, and shown on Figure 1-8 that will be excavated during the eventual Doyle Drive replacement project construction. These LUCs will be discontinued after contaminated soil is excavated.

- Additional temporary LUCs will be implemented, as required, if physical features and/or adjacent remediation sites preclude horizontal expansion of the excavations based on confirmation sampling results, and over-excavation to remove all soil contamination containing concentrations of petroleum-related COCs above cleanup levels can not be removed as described in Section 2.1.6.

- The LUC for all groundwater RUs will be discontinued after groundwater monitoring indicates corrective actions have reduced concentrations of RU-related COCs below cleanup levels for four consecutive sampling events as described in Section 2.1.7.

LUCs refer to administrative restrictions on the potential future use of land based on the levels of contaminants that may be left onsite at concentrations greater that allow for unrestricted use. The Trust generally does not consider LUCs by themselves to meet the cleanup goals for sites where contaminated materials remain left in-place and potentially exposed. LUCs restrict future site use and future site activities in order to limit exposure to COCs left in place or to ensure the effectiveness of the selected site remedy. The Building 207/231 RUs are located in Area B of the Presidio. Existing and planned land uses in Area B are directed by the Trust through its comprehensive land use and management plan, the Presidio Trust Management Plan (PTMP) (*Trust, 2002*). LUCs in Area B are managed in accordance with the Trust's Land Use Controls Master Reference Report (LUCMRR) (*Trust, 2006a*).

The LUCMRR serves as the Trust's overall implementation and enforcement plan to meet the requirements of State of California requirements and §5.11 of the Consent Agreement (*DTSC, 1999*). The LUCMRR provides the framework for LUC management in Area B and describes the procedures the Trust will use to track, implement and enforce LUCs at remediation sites in Area B where LUCs are part of the selected remedy. For each Site identified as requiring an LUC, MACTEC will assist the Trust, who will prepare a site-specific addendum to the LUCMRR. Each site-specific LUCMRR addendum will

include a figure that employs Geographical Information System (GIS) coordinates and depicts the site location and nearby area, and will summarize the site history, the specific COCs encountered at the site, the actions taken to remediate the site, the in-place management system (such as containment), the levels and general locations of COCs remaining at the site that required the implementation of the LUC, and site-specific restrictions for that LUC area. The LUC areas will be surveyed during excavation activities to locate the limits of the LUC areas (defined by the toe of the excavation and/or the limits of the soil RU depicted on Figure 4-2) within each RU.

The site-specific LUCMRR addenda will be added to the Trust's GIS system that serves as an informational database for all remediation sites with LUCs in Area B of the Presidio. In addition, these site-specific addenda will discuss restricted or prohibited land uses at the site and any special requirements (e.g., health and safety requirements) if the area is disturbed in the future.

As described in Section 5.0, the Construction Completion Report will document the Site-Specific Addendum to the LUCMRR, including all progress reports, implementation reporting communications, data, and records. The site-specific LUCMRR addenda will be added to the Trust's Geographical Information System (GIS) system that serves as an informational database for all remediation sites with LUCs in Area B of the Presidio, and a copy will be attached to the Construction Completion Report. The LUCMRR identifies the content requirements of site-specific addenda.

3.0 CORRECTIVE ACTION IMPLEMENTATION FOR SOIL AND GROUNDWATER

This section describes the pre-construction, construction, and post-construction activities associated with implementing the approved corrective actions outlined in Section 2.0.

The corrective actions will be implemented in conformance with applicable state and federal laws and regulatory requirements including the requirements of Title 23, Division 3, Chapter 16, Article 11, which are the primary regulations establishing the requirements and standards for petroleum-related corrective action in the State of California. Applicable regulations and requirements pertain to the protection of park resources, the handling and transportation of wastes, the control of particulate emissions and pollutants, and other construction-related activities.

Implementation of the corrective actions will proceed upon Water Board approval of this Work Plan. The Trust will notify the Water Board, NPS, and DTSC a minimum of two weeks prior to the initiation of the field components of the corrective action implementation. Review processes will be completed before the corrective actions are implemented. The Trust will review relevant aspects of the project in their "N Squared" Group review that combines their respective National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) reviews.

3.1 Pre-Construction Activities

This section identifies tasks that have been performed or are to be performed in preparation for construction. The following pre-construction activities will be performed as part of the corrective actions prior to commencement of excavation construction activities and generally in the sequence presented below:

1. Installation of New Well 1 downgradient of Building 228 RU
2. Pre-Construction Groundwater Monitoring
3. Well Abandonment
4. Notifications, Permitting, and Regulatory Approvals
5. Project Kickoff Meeting
6. Subsurface Utility Clearance
7. Implementation of Building 228 RU corrective actions described in Section 2.1.1
8. Setup of temporary facilities including fencing, site controls, etc.
9. Pre-construction Surveying
10. Setup of Storm water Pollution Prevention and erosion control measures
11. Implementation of the Traffic Control Plan
12. Utility Decommissioning

13. Installation of Temporary Sanitary Sewer Connection.

3.1.1 Installation of Building 228 RU Monitoring Well

T&R will install, develop, survey, and sample the new downgradient monitoring well (New Well 1) at least one month prior to in situ injection of an oxygen releasing compound (ORC Advanced™) (see Figure 1-8 for well location). Monitoring will provide baseline data to assess downgradient groundwater conditions and compare with post-ORC Advanced™ injection analytical data.

T&R will install and develop the new well following the guidelines set forth in the *Presidio-Wide Quality Assurance Project Plan* (Presidio-Wide QAPP; *Tetra Tech, 2001*) Standard Operating Procedure (SOP) No. 004 and 005 specifically (Appendix F); specifically, it will be installed using a hollow-stem auger rig, constructed with 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing, and a 2-inch diameter 0.010 slotted casing with 2/12 sand, screened from 5 to 20 feet bgs. The location and elevation will be surveyed by a licensed land surveyor to within ±0.01 foot accuracy in accordance with survey requirements in Section 3.1.8. This well will be sampled as part of the Presidio-wide quarterly groundwater monitoring program and sampling schedule as summarized in Table 2-1; the first round of sampling will be performed separately if it is not installed in time for the regularly scheduled sampling event.

3.1.2 Pre-Construction Groundwater Monitoring

Approximately one month prior to ORC Advanced™ injection within the northern portion of the Building 228 RU, and approximately three months prior to initiation of excavation activities, T&R will perform pre-construction groundwater monitoring for RU-specific groundwater COCs, redox parameters, and field analytes from 11 existing wells and New Well 1, as summarized in Table 2-1. The pre-construction groundwater monitoring will be conducted to establish a baseline that will later be used to compare with post-construction COC concentrations in groundwater. In addition, because a groundwater monitoring well is not present within the Building 228 RU to provide reproducible data on groundwater contamination and conditions, data from the newly installed well, New Well 1, will be evaluated and the design basis for ORC Advanced™ injection described in Appendix E will be reassessed to determine if modifications to the ORC Advanced™ injection rate are required. If the data indicates that a lower or higher injection rate is warranted, then this assessment and any recommendations will be provided during one of the weekly stakeholder meetings prior to implementation of ORC Advanced™ injection.

3.1.3 Well Abandonment

The Trust will coordinate pre-construction well abandonment after pre-construction groundwater monitoring is completed. Prior to construction, T&R will subcontract a Presidio-experienced driller to abandon existing monitoring wells or piezometers (47 wells/piezometers are planned) in accordance with the CAP upon regulatory approval. T&R will abandon these wells/piezometers in accordance with the SOPs identified in Appendix F and State of California Water Well Standards and County of San Francisco Department of Environmental Health (County) requirements, with the exception that neat bentonite (versus cement) will be used to backfill the borings within the Quartermaster Reach Marsh restoration area (bounded by Halleck Street to the west and Marshall street to the west). Bentonite is more compatible with planned marsh restoration than cement. Neat cement will be used to backfill the borings outside the footprint of the Quartermaster Reach marsh restoration area. The surface of all borings will be patched with concrete, except in areas to be restored with landscaping. In landscape areas, the borings will be backfilled with bentonite to the surface.

As outlined in Table 2-1 (Groundwater Monitoring and Well Abandonment Program), T&R will abandon the following wells prior to construction and in accordance with the CAP (see Figure 3-1 for wells to be abandoned):

- Forty existing groundwater monitoring wells within the Building 207/231 CAP Area that are not included in Groundwater Monitoring Program required by the CAP, and

- Seven existing groundwater monitoring wells within the Building 207/231 CAP Area that are included only in the Pre-Construction Groundwater Monitoring Program required by the CAP.

3.1.4 Notifications, Permits, and Approvals

Regulatory Approvals: Prior to the start of construction, the Trust will receive approval to start the remedial activities from:

- Water Board – MACTEC will submit this Work Plan to the Water Board, who is the lead regulatory agency for the Site for their approval of the Work Plan.

- DTSC – MACTEC will submit this Work Plan to the DTSC for their approval.

- Water Board - MACTEC will file a notice of intent and submit the Storm Water Pollution Prevention Plan (SWPPP) that outlines erosion control and storm water pollution prevention measures for review and approval by the Water Board (Appendix A).

Trust Actions: Prior to the start of excavation, the Trust will:

- Issue a Presidio Excavation Permit;

- Approve the plan for utility decommissioning, temporary utility reroute, and reinstallation following completion of excavation.

- Notify CalTrans at least two weeks prior to the start of demolition and excavation activities, of the project schedule upon regulatory approval of the Work Plan for excavation areas adjacent to the Doyle Drive overpass structures within the Building 207, 231, and 38 RUs; and

- Review groundwater analytical data to assess potential concentrations and types of COCs in water that will be extracted as a result of dewatering activities in the excavations, and preparing necessary documentation to gain approval for discharge into the sanitary sewer in accordance with the Trust's industrial wastewater permit.

- Complete project review by the Trust's N Squared Group, which is required for Area B sites.

MACTEC and the Trust have initiated contact with the various resource groups that have an interest in the project. This process will continue throughout the pre-mobilization phase, scheduled for the Spring 2008. In addition, the Trust will also notify the stakeholders of the start date approximately a month before project kick-off.

NPS Approvals: MACTEC will submit this Work Plan to the NPS, and Brian Ullensvang, with the assistance of Ryan Seelbach, will review and concur on this Work Plan.

Contractor Notifications/Submittals: The Contractor will make the following notifications:

- Notify Bay Area Air Quality Management District (BAAQMD) for soil stockpile management and dust control (Contractor).

In addition, the Contractor will provide the following pre-construction submittals to MACTEC for review and approval:

- Construction Schedule;
- Site Health and Safety Plan;
- Decontamination Facilities Layout;
- Hazardous Waste Operations and Emergency Response (HAZWOPER) Qualifications Certificates;
- Acceptance of the Traffic Control Plan outlined in Appendix B of this Work Plan;
- Waste Characterization and Management Plan; and
- Products Data (i.e., for water piping, sanitary sewer piping, storm drain piping, import fill, etc.; see accompanying Construction Documents [*MACTEC, 2007c*] for full list).

3.1.5 Project Kickoff Meeting

Prior to Contractor mobilization, a project "kick-off" meeting will be held at the Trust's office at 67 Martinez Street. The Trust, NPS, MACTEC, the Water Board, the RAB, the Golden Gate National Parks Conservancy (GGNPC), neighboring tenants, and the Contractor will attend this meeting. Specific items to be discussed will include the following:

- Project roles and responsibilities of key project personnel;
- Lines of communication to be maintained by project personnel;
- Overview of the scope of work to be executed;
- Notifications required prior to temporary disconnection of service to allow utility decommissioning;
- Pre-construction and Construction Sequencing;
- Traffic control measures to be deployed during construction;
- Health and Safety Protocol; and
- Exposure monitoring to be conducted at the Site.

3.1.6 Subsurface Utility Clearance

The Contractor will conduct intrusive activities, such as excavation, under a Trust excavation permit. The Trust will direct management of utilities discovered during construction.

The Trust's utility department has located and marked known utilities in the immediate vicinity of the proposed work prior to be performed as part of the corrective actions. The Contractor will contact

Underground Services Alert (USA) at least 48 hours in advance of intrusive work. The Contractor will also subcontract a private utility locator who will conduct an independent utility clearance to confirm that the locations marked by the Trust's utility department are accurate. The Contractor will review the Construction Drawings included in the Construction Documents accompanying this Work Plan (*MACTEC, 2007c*), and will notify the Trust of any discrepancies found between the drawings and field conditions.

MACTEC, T&R, and EKI will conduct separate utility surveys as required for their portions of the field work.

3.1.7 Building 228 RU Corrective Action

The following corrective actions for the Building 228 RU will be performed independent of excavation-related activities for the other RUs, but will be initiated prior to excavation as part of pre-construction activities at the Site. It is anticipated that the in-situ ORC Advanced™ injection described herein will be completed two months prior to initiation of excavation activities.

3.1.7.1 In Situ Injection of ORC Advanced™ at Building 228 RU

The approved corrective action for treatment of residual petroleum contamination above cleanup levels in saturated soils and groundwater in the northern portion of the Building 228 RU includes injection of an in-situ oxygen releasing compound slurry (ORC Advanced™) between the northern wall of historic Building 228 and the historic wall using direct push technology. MACTEC will contract with and oversee a direct push injection subcontractor, who will inject ORC Advanced™ through overlapping direct push injection points. The ORC Advanced™ injection will be conducted approximately 1 month after the pre-construction groundwater monitoring and 2 months prior to initiation of excavation activities.

ORC Advanced™ Design Basis: Appendix E (Oxygen Releasing Compound Injection, Building 228 RU) presents site-specific data and calculations provided by the oxygen releasing compound manufacturer for the ORC Advanced™ product along with the remedial design assumptions that were used to calculate application rates. 0.4 percent of ORC Advanced™ is recommended by Regenesis, Inc. based on their review of Site data (see Appendix E).

The on-center spacing between injection points in each row of injection points is recommended to be 10 foot (i.e., in the east west direction) and that between rows is recommended to be 5 foot (i.e., in the north south direction) for an area of influence of each injection point of 50 square feet.

For the proposed corrective action at the Building 228 RU, Regenesis recommended ORC Advanced ™ be applied at 0.4 percent ORC Advanced ™ by weight of impacted soil. Based on an average estimated weight of 110 pounds per cubic feet for typical site soils (that will be reassessed based on site-specific data to be collected for New Well 1), and an area of influence of 50 square feet for each injection point, the volume of impacted soil is estimated to be 50 cubic feet per foot of each injection point for a weight of impacted soil of 5,500 pounds per foot of injection point. At an application rate of 0.4 percent by weight of impacted soil, the weight of ORC Advanced™ per foot of injection point is estimated to be 22 pounds per foot.

ORC Advanced™ Application Procedure: MACTEC will subcontract with a driller who will drill the injection points with a direct push drill rig. Based on these assumptions, in order to achieve an ROI of approximately five feet and provide in-situ treatment throughout the RU, twelve injection points will be

drilled in three rows of four points each, with the rows spaced approximately five feet apart as shown on Figure E-1 in Appendix E. Each injection point will be drilled throughout the saturated zone of detectable petroleum-related COCs in soil and/or groundwater (anticipated to be approximately 6 to 20 feet bgs). The slurry will be mixed in a ratio of 30 to 40 percent solids to clean water, and will be injected at the design rate noted above.

- ***Post Injection Performance Monitoring:*** As summarized and in accordance with the schedule presented in Table 2-1, T&R will collect groundwater samples and submit them for analysis from the New Well 1.

Following injection, the effectiveness of the ORC Advanced^{TM} in creating conditions favorable for biodegradation of petroleum hydrocarbon compounds will be assessed through the groundwater monitoring conducted to verify that:

1. DO levels are increasing in the new well relative to pre-injection conditions.

2. Fe(III) concentrations are increasing through the reduction in dissolved iron concentrations as Fe (III) is insoluble relative to Fe(II) relative to pre-injection conditions.

3. Dissolved manganese concentrations are decreasing (as a result of oxidation from Mn(2+) to the insoluble Mn(4+) relative to pre-injection conditions.

4. Dissolved arsenic concentrations are reducing (as a result of the conversion of arsenite to the more oxidized and insoluble form of arsenate) relative to pre-injection conditions.

Based on experience with sites with similar geologic settings, MACTEC expects the oxygen releasing compound to begin releasing oxygen immediately upon introduction into the water column and to continue to release oxygen for a period of approximately 18 months. Two years after the oxygen release compound has been injected, the Trust will conduct in situ direct-push technology (DPT) soil confirmation sampling within and outside of the footprint of the RU considering the technical constraints of access due to the presence of existing buildings or other structural constraints. Details regarding the confirmation sampling will be described in an appendix to the Construction Completion Report based on the results of post-construction groundwater monitoring that assesses the effectiveness of oxygen release compound injection in reducing petroleum-related COCs within the saturated zone (see Section 3.3.7 for further discussion).

3.1.7.2 Indoor Cap Inspection and Indoor Air/Soil Vapor Sampling at Building 228 RU

The existing foundation slab of Building 228 is serving to limit the intrusion of VOCs from the subsurface into the indoor air of the building. EKI will inspect the foundation and adjacent areas to confirm absence of VOC entry routes into the building. EKI will also conduct indoor air and soil vapor sampling in accordance with Appendix H (Indoor Cap Corrective Action, Building 228 RU) .

Based on the building inspection, if improvements are necessary, EKI will conduct these improvements during construction. These improvements may include: (1) sealing the large cracks, if observed, during the indoor cap assessment; and (2) sealing pipe and conduit penetrations, to prevent occupant exposure to potential volatile COCs in the subsurface within the building.

Appendix H describes the specific actions needed to inspect the indoor cap, identify the need for improvements, and conduct the assessment of potential vapor intrusion to indoor air and indoor air

sampling in accordance with the Department of Toxic Substances Control (DTSC) Guidance (*DTSC, 2004*) inside Building 228. Section 5.4, Table 1-1, and Figure 1-9, respectively, present the documentation procedures for the Building 228 Indoor Cap Corrective Action, the project team responsibilities, and scheduling associated with this corrective action.

The results of the investigation and improvements conducted, if necessary, will be included in the Construction Completion Report.

3.1.7.3 Outdoor Cap Inspection at Building 228 RU

The objectives of the Outdoor Cap Inspection are to inspect and document the existing surface outside the footprint of the building. MACTEC will perform this inspection and documentation. The existing outdoor cap over this LUC area consists of pavement. MACTEC's inspection and documentation will include taking photographs and preparing a written description of the existing outdoor cap. However, if during inspection, if it is determined that the outdoor cap requires improvement, MACTEC will consult with the Trust, NPS, and stakeholders regarding the need for backfilling holes and/or paving the area surrounding the building and within the designated LUC area. If there is consensus among the project team that physical improvements are necessary, then the Contractor will perform the improvements, and the results will be documented in: (1) the weekly progress reports during construction; (2) the Construction Completion report; and (3) the Site-Specific Addenda to the *Land Use Control Master Reference Report for the Presidio* (LUCMRR) (*Trust, 2006a*). Section 5.5 and Tables 1-3 and 1-4 and Section 6.0, respectively, present documentation procedures for the outdoor cap inspection, the project team responsibilities, points of contact, and scheduling associated with this corrective action.

3.1.8 Temporary Facility Controls

Prior to the start of construction, the Contractor will:

- Mobilize a temporary trailer office (which will require utilities), sanitary facilities for workers, and mobilize equipment storage units;
- Install perimeter fencing around the project work area;
- Install fuel storage facilities with a spill kit;
- Construct stockpile storage staging areas; and
- Establish a truck staging area.

Mobilize Temporary Trailer Office, Sanitary Facilities, and Equipment Storage Units: The Contractor will mobilize sanitary facilities and equipment storage containers (as required) to the Site. Proposed location is shown on Figure 1-2. The Control will arrange for sanitary waste to be removed and disposed at an off-site facility in accordance with applicable laws and regulations.

Install Perimeter Fencing Around Project Work Area: The Contractor will install a perimeter fence at the location shown on Figure 1-2, two weeks prior to the start of construction. The temporary fence will be bounded by Buildings 228 and 229 to the south, Halleck Street to the west, Old Mason Street to the north, and Building 230 to the east.

Install Fuel Storage Facilities with a Spill Kit: For refueling, the Contractor will use double wall fuel tanks, which will be located adjacent to the temporary office trailer. The Contractor will:

- Place spill response equipment nearby when transferring fluids
- Place drip pans under vehicles and equipment until repaired
- Clean spilled fluids promptly
- Designate parking spaces for construction equipment to determine sources of leaking equipment
- Repair leaking equipment within 24 hours of leak detection.

Establish a Truck Staging Area: The Contractor will stage the trucks along Old Mason Street, either just west of Building 610 or east of Marshall Street (see Figure 1-2 for location).

Construct Soil Stockpile Staging Areas: The Contractor will construct and maintain soil staging facilities for stockpiling of excavated soil. Figure 1-2 shows locations of stockpile staging areas. Soil removed from the excavations may be temporarily stored in the vicinity of the excavations, but at a minimum setback of at least 20 feet; the temporary volume of stockpiles will be no more than 250 cubic yards. Loaders will transport soil from temporary stockpiles in stockpiles to soil staging area for truck loading at the stockpile staging area located between the north and south sections of the Doyle Drive overpass (see Figure 1-2 for locations).

The Contractor will construct stockpile storage areas by placing a minimum thickness of 20-mil plastic bottom liner on the ground surface, a 10 mil plastic liner on top, and placing weed-free straw wattles around the plastic. A 6-inch thick sand bedding layer will be placed beneath the 20-mil plastic to prevent impacts to underlying fill at the staging areas. Following completion of field activities, the Contractor will remove and dispose off site the sand bedding material and the liners. When material is not being placed or removed, the Contractor will cover the stockpiles with a weighted plastic cover.

Alternatively, the Contractor will be allowed to pre-profile the excavation area and direct haul the excavation spoils into haul trucks for off-site disposal.

3.1.9 Pre-Construction Surveying

The Trust's contractors will subcontract licensed land surveyors to perform surveys, which consist of:

- Horizontal and vertical coordinates of the top of casings of the New Well 1.
- Horizontal coordinates of the sub-slab soil vapor sample locations.
- Horizontal coordinates of the ORC Advanced™ injection points.
- Excavation control points for assumed excavation boundaries, pavement and concrete removal.
- Control points for demolition of asphalt and concrete.

The surveyor will establish markings and monuments to control the work. Horizontal and vertical survey controls will be as follows:

- Horizontal control for the surveys will be on NAD 27 California State Plan – Zone 3 – U.S. Survey Feet.

- Vertical control for groundwater elevations will be on the PLLW datum; vertical control for other work (besides groundwater elevations) will be on NAVD 88. The PLLW datum is 0.06 feet higher than the NAVD 88.

The tolerances in setting survey stakes, permanent survey monuments, project benchmarks, and construction control markers are as specified below:

Type of Line or Mark	Horizontal Position	Elevation
Permanent Survey Monuments, Wells, Sample Locations, Borings, And Utilities	1 in 10,000	+0.01 feet
Survey Stakes, Project Benchmarks, Construction Control Points	1 in 2,000	+0.1 feet

The Contractor will submit copies of registered site drawings within seven days of completion for each survey required.

3.1.10 Storm Water Pollution Prevention and Erosion Control Measures

The Trust has prepared a storm water pollution prevention plan (SWPPP) for the project in accordance with regulatory requirements for construction storm water pollution management. A copy of the SWPPP is presented in Appendix A. The Contractor will employ best management practices (BMPs) to reduce the sediment load for runoff from the site. Prior to initiating the excavation activities, the Contractor will implement BMPs on site.

Specific practices that will be implemented to reduce the sediment load of storm water runoff from the excavation areas include the installation of storm water control devices (e.g., straw wattles around excavation areas, straw wattles around catch basins around the project area, and placement of silt fence fabric under catch basin grates). All straw wattles utilized on the project will be certified as weed free and seed free.

3.1.11 Traffic Control Plan

Figure B-2 of Appendix B shows a traffic control plan for use on site during construction. The construction equipment and other appurtenances will be staged within the fenced project area shown on Figure 1-2.

The proposed Transportation Plan shown on Figure B-2 and the Traffic Control and Signage Guide (Appendix B) provides requirements for the Contractor to maintain and protect pedestrians, bicycle and vehicular traffic on affected roads and parking areas during RU construction except as directed by the Trust. The Contractor will protect traveling public from damage to person and property during construction activities.

The Contractor will confirm compliance of the presented traffic control plan.

The following road closure is anticipated:

- Gorgas Avenue – from Halleck Street on the west to Marshall Street on the east.

Additional road closures may be required if excavation proceeds beyond the limits depicted on Figure 2-2A and 2-2B and into adjacent streets. If such road closures are necessary, the Contractor will present a plan to the stakeholders for approval.

3.1.12 Utility Decommissioning

Several utilities (i.e., water, gas, electrical, telecommunication, sanitary sewer, and storm drain) exist within and in the vicinity of the excavation areas. Additional details for utility decommissioning are included in the accompanying Construction Documents (*MACTEC, 2007c*).

Water and Gas: The Contractor will decommission water and gas lines that traverse through the excavation as follows:

- close isolation valves on both sides of the excavation areas to eliminate supply into the lines within the limits of the excavations;
- cut and cap the lines at the limits of the excavations;
- remove the lines from within the excavations; and
- open isolation valves previously closed (to allow removal of utilities from within the excavation limits).

Sewer: A 16-inch sewer line that traverses through the Building 231 RU will be removed and the lines extending from the limits of the excavation to the nearest manholes on either side of the excavation will be abandoned in place by inserting grout plugs at the ends. The sewer line will be removed during excavation.

Storm Drain: Drain inlets and shallow storm drain piping that connect the drain inlets to the existing onsite storm drains from within the excavation foot-print will be removed by the Contractor. Further, a 20-inch abandoned storm drain line, located within the footprint of the excavation will be removed by the Contractor. The noted storm drain lines will be removed during exaction.

The noted detailed instructions for notification to tenants affected by the utility decommissioning work and the steps to be followed by the Contractor to decommission utilities within the limits of the excavation are presented in the accompanying Construction Documents (*MACTEC, 2007c*).

3.1.13 Temporary Sanitary Sewer Connection

Temporary sewer connection will be provided to reroute sewage around the Site to the main sewer trunk line, located on Edie Road, which is located to the southeast of Building 1029. Detailed instructions to be followed by the Contractor are presented in the accompanying Construction Documents (*MACTEC, 2007c*).

3.2 Construction Activities

This section identifies tasks that are to be performed during construction. The tasks are presented in the order that they would be performed in the field:

1. Site Clearing
2. Dust Mitigation During Construction
3. Protection of Resources
4. Protection of Existing Utilities
5. Excavation
6. Soil Confirmation Sampling
7. Stockpile Management and Profiling
8. Post Excavation Record Survey
9. Backfilling and Grading
10. Off Haul of Excavation Spoils
11. Utility Replacement.

3.2.1 Excavation Sequencing

The following sequence of execution for the RU-specific activities is anticipated to be performed during excavation, that may be refined or revised as described in the Contractor's Excavation Procedures Plan will detail excavation sequencing:

1. Building 230 RU Excavation
2. Former Building 38 RU Excavation
3. Former Building 207 RU Excavation
    a. Former Building 207 Excavation
    b. Former Building 208 Excavation
4. Former Building 231 Excavation.

3.2.2 Site Clearing

The Contractor will remove:

- Asphalt, paving, and concrete surface structures within and adjacent to each RU excavation area (Figure 3-2).

- The existing below-ground soil vapor extraction system piping located within the Former Building 231 RU (Figure 3-2).
- The portion of Gorgas Avenue pavement within the Building 231 RU (Figure 3-2) in coordination with the Trust to minimize impacts to local traffic (Figure 3-2).

3.2.3 Dust Mitigation During Construction

Construction activities such as clearing, excavation, backfilling and grading operations, construction vehicle traffic on unpaved ground, and wind blowing over disturbed soil may generate dust and particulate matter under dry conditions.

The Excavation Contractor will implement dust control measures to eliminate or minimize the generation of dust associated with the earthwork activities, truck traffic onto and off the site, and the effects of wind traversing exposed soil.

Dust control measures at the site will consist of:

- Reducing vehicular speeds within the area of construction;
- Covering or wetting stockpiles of debris, soil, sand or other materials that can be blown by the wind;
- Misting or spraying water while excavating and loading soil while minimizing ponding;
- Providing equipment and staffing for watering of exposed or disturbed soil surfaces sufficient to suppress dust plumes, including weekends and holidays;
- Minimizing drop heights while loading/unloading excavated soil;
- Minimizing the amount of excavated material or demolition wastes stored on site;
- Covering truck beds loaded with excavated soil leaving the Site;
- Sweeping adjacent streets of soil and mud; and
- Suspending earthmoving or other dust-producing activities during periods of high winds, whenever dust control measures do not greatly reduce visible dust plumes.

3.2.4 Protection of Resources

The Excavation Contractor will follow the cultural and natural resources and health and safety protocols outline below during excavation activities:

3.2.4.1 Resource Protection and Safety Protocols

Corrective action implementation will be conducted in accordance with NHPA and NEPA because the Site is in proximity to areas known to be archaeologically sensitive. MACTEC will monitor activities in accordance with the Programmatic Agreement for the Presidio between the Trust and the State Historic Preservation Officer. Work will be performed in consultation with and approval by Trust and NPS historians and archaeologists. If items of archeologically or historically sensitive importance are found or suspected to be present, the Contractor will stop work. Appendix D (Protocols for Archaeological

Artifacts) describes procedures to be followed for handling of any archaeological artifacts identified during construction. The Contractor will resume work in these areas following coordination with and approval by Trust and NPS historians and archaeologists.

No natural resources are anticipated to be encountered based on previous investigations conducted at the Site. Cultural resources include two historic walls, Buildings 201, 227, 228, 229, 230, and Gorgas Avenue. The Trust Project Manager will coordinate the corrective action implementation with Trust and NPS naturalists, historians, and archaeologists regarding sensitive areas that may exist at or near the RUs and consult with the Excavation Contractor regarding appropriate precautions to be taken during the corrective action implementation.

3.2.4.2 Cultural Resources Protection

The Trust and the Contractor will implement measures and work practices to maintain the integrity of the respective historic structures and their surroundings during corrective action implementation. Building 228 (and adjacent Buildings 227, 229, and 201), Building 230, the historic wall adjacent to the southeast corner of Building 201, the wall south of Building 231 and the wall adjacent to Halleck Street (west of Building 231) are historic structures of contributive value to the National Historic Landmark (NHL), and therefore, have been designated to be preserved. The Gorgas Avenue route is an historic structure of contributive value as a NHL and the Gorgas Avenue connection is designated to be preserved (except for the portion of roadway that will be removed prior to excavation that will be replaced in accordance with cultural resource guidelines). Guidelines for protection of these cultural resources were presented in a memo addressed to Ryan Seelbach, Presidio Trust Project Manager dated October 16, 2006 by Christina Wallace, Trust Historic Compliance Coordinator *(Trust, 2006b*).

The Contractor, MACTEC, and the Trust oversight team will monitor activities that could affect the historic walls or buildings or other important Site features during the corrective action implementation.

A subsurface geoarchaeological survey of the Building 207/231 Area was performed between January 23 and 27, 2006 according to the *Draft Workplan for Subsurface Geoarcheological Survey of the Building 207/231 Area, Presidio of San Francisco, City and County of San Francisco, California* (*ASC, 2005*). Results of the survey were presented in the *Draft Subsurface Geoarchaeological Survey of the Building 207/231 Area, Presidio of San Francisco, City and County of San Francisco, California* (*ASC & MACTEC, 2006*). The goals of the survey were to document the presence or absence of cultural deposits exposed in subsurface survey trenches, and provide an account of the depositional history of the project area. The survey concluded that there is low potential that buried archeological remains are present within the project area and recommended no further archaeological work at this time.

The Trust will be working closely with a Trust archaeologist during excavation of impacted soil to minimize the potential for damaging cultural resources that may be encountered during the work. Appendix D (Protocols for Archaeological Artifacts) presents protocols for management of significant archaeological or cultural resources discovered during the corrective action implementation have been developed as part of the above-referenced survey.

The Trust Project Manager will coordinate with Trust historians and archeologists during excavation and if items of potential archeological or historically sensitive importance are found or suspected to be present. If potential human remains are identified, work in the vicinity of the discovery will cease and the Trust will contact the San Francisco Coroner's Office (SF Coroner). The SF Coroner will investigate and remove the remains, if appropriate.

The following cultural resource protection guidelines specific to individual RUs are incorporated into the accompanying Construction Documents (*MACTEC, 2007c*).

- **Building 228** (and adjacent Buildings 227, 229, and 201) – No excavation will be performed in the area of Building 228 and the historic wall to the north. Protection will include installation of a high visibility orange construction fence a minimum of three feet from both the building foundation and the south side of the historic wall. Oxygen releasing compound injection performed as part of the corrective action for this area will not occur within the separation area designated by the construction fence. The wall and foundation protection will remain in place until completion of injection activities.

- **Building 230** – As a protection measure, a minimum 3-foot separation will be maintained from the building foundation during asphalt removal, excavation and backfill activities. If confirmation sampling indicates over-excavation will extend under the loading dock, the Construction Manager will consult with the Trust Project Manager regarding excavation methods and preservation of the loading dock structure.

- **Building 231 Area** – The historic walls to the south and west of Building 231 will require in-place protection prior to and during Building 231 demolition and excavation of the Building 231 RU. Protection will include installation of a high visibility orange construction fence a minimum of five feet from the north face of the south wall and the western wall adjacent to Halleck Street. Work in the vicinity of these walls will not occur within the separation area designated by the construction fence. The wall protection will remain in place until completion of backfilling and grading activities.

3.2.4.3 Natural Resources Protection

The Site is located in an industrial/commercial area of the Presidio containing primarily buildings, associated parking and paved areas. The majority of the Site (south of the northern edge of the Northern Doyle Drive Overpass) is located within a freshwater ecological protection zone. The area of the Site north of the Northern Doyle Drive Overpass and south of Crissy Marsh is located within a saltwater ecological protection zone. It is not anticipated that any ecologically sensitive areas/plants/animals will be present. If an animal/plant is discovered in the area that may be of ecological importance, the Construction Manager will notify the Trust, and arrange to have one of the Trust’s biologists determine if work can continue or if further measures must be undertaken.

3.2.4.4 Project Health and Safety

A Health and Safety Plan (HASP) (also called a Site Safety and Health Plan [SSHP]) will be prepared by each contractor or subcontractor for implementing their scope of work. The HASPs will be developed following Federal and California Occupational Safety and Health Administration (Cal OSHA) guidelines and other local requirements. Contractors will follow their own HASP(s) and will designate an on-site Health and Safety Officer to coordinate emergency response actions and describe emergency response coordination.

At a minimum, each HASP will:

- Present a baseline program for establishing and maintaining a safe working environment during the implementation of the corrective action

- Address the hazards (i.e., job hazard analysis) associated with the soil removal activities

- If relevant, address the reduction of potential hazards for the local public (e.g., fugitive dust, noise, traffic, etc.).

Site visitors will be required to adhere to the Contractor HASP, including restricted site access, log-in sheets for visitors, and appropriate personal protection equipment (e.g., hard hats and safety vests). The Contractor and/or Trust oversight team will communicate health and safety requirements to site visitors as part of the hazard communication required before entry to the site.

3.2.5 Protection of Existing Utilities

The Contractor will protect in place the following utilities present within each RU during excavation:

- 72-inch storm drain; and
- Telecommunication lines within the Building 231 and 207 RUs.

The Contractor will:

- Identify the alignment and depth of utilities to be protected prior to construction by potholing.
- Perform an assessment as to whether a utility can be protected in place. If a utility cannot be protected in place, the Contractor will present a plan for removing and replacing the section of utility impeding construction during one of the weekly stakeholder meetings for approval.

Details for protection of utilities are included in the accompanying Construction Documents.

3.2.6 Excavation Activities

This section describes Contractor requirements for excavation activities associated with removal of impacted soil from each RU, including excavation dewatering and waste water management, excavated soil management and disposal, and potential contingency actions.

3.2.6.1 Soil Excavation

The Contractor will locate excavation areas shown on Figure 2-2A and 2-2B in the field during the Contractor's pre-construction topographic survey using stakes, paint and construction tape during the survey. Prior to excavation, MACTEC, the Trust, and the Contractor will hold a site survey staking review meeting to confirm the marked locations of the assumed excavation areas are correct. Surveying will be performed by a State of California Licensed Surveyor as described in Section 3.1.9.

During excavation of impacted soil from the RUs identified in Section 2.1 and shown on Figure 2-2A and 2-2B, approximately 23,000 cubic yards of soil is estimated to be removed. The total volume to be excavated may increase depending on the results of excavation soil confirmation sampling of sidewalls and excavation bottoms within each RU as described in Appendix I (Confirmation Sampling Plan).

During excavation of impacted soil, the Contractor will:

- Excavate material within the assumed excavation areas shown on Figures 2-2A and 2-2B. Although the accompanying Construction Documents (*MACTEC, 2007c*) include excavation areas as shown on Figure 2-2A and 2-2B, the Trust in collaboration with the NPS, the Water Board, and other stakeholders will determine the actual vertical and horizontal extent of the excavations based on

confirmation sampling results and the need for over-excavation in order to remove soil cleanup level exceedances. Section 2.1.6 and Appendix I (Confirmation Sampling Plan) describe these protocols.

- Remove the backfill material from the geoarchaeological trenches and dispose excavation spoils offsite.

- Remove decommissioned utilities from within the excavation footprint.

- Ensure stability of sidewalls of excavations by maintaining safe sidewall slopes. Sidewall slopes are presented on Figures 2-2A and 2-2B for planning purposes. If the Contractor deems the excavation sidewalls to be stable, excavations with steeper sidewall slopes can be implemented, if required, to remove COC impacted soils.

- Support confirmation sampling performed by MACTEC by working in other parts of the Site during soil confirmation sampling activities in excavated areas. The Trust will consult with MACTEC and stakeholders as described in Sections 4.3 and 4.4 to determine the final depths and dimensions of each RU excavation based on comparison of confirmation sampling results with cleanup levels described in Table 1-1, as well as field identification of native soil (i.e., Bay Mud).

- Manage wet conditions at the bottom of the excavation due to groundwater seepage by using natural sand. The Contractor may elect to place sand within the bottoms of RU excavations requiring entry of Contractor equipment, to improve equipment mobility in accordance with the accompanying Construction Document criteria (*MACTEC, 2007c*). Trust-approved material will be sampled and tested prior to use in accordance with Construction Document criteria for backfill.

- Prepare and implement a Dewatering Plan as required by the Construction Documents in accordance with guidelines outlined in Appendix C (Dewatering Plan), because it is anticipated that groundwater will be encountered during excavation activities and will continually be seeping into the excavations during construction.

- Protect utilities in place (e.g., 72-inch storm drain and telecommunication lines, etc.) and repair any damage to utilities that may occur during construction activities.

- Profile waste in accordance with offsite disposal facility requirements, including filling out and submitting manifests and backup materials (such as certified test results and sampling methods) to the Trust for review.

- Determine the method of offsite disposal based on waste profile results. The Contractor will determine disposal options in consultation with the Trust.

- Surface-clean trucks transporting debris offsite for disposal before leaving the site using dry methods (such as a broom). No wet washing of tires is anticipated.

- Cover truck loads from the point of departure at the site to the disposal landfill. It is unacceptable for waste or potentially contaminated material to be tracked by truck tires offsite. The Trust reserves the right to clean streets of waste caused by trucks leaving the site and bill the Contractor for the cost of street cleaning.

3.2.6.2 Excavation Dewatering

Soil will be excavated below the static groundwater level for each RU described in Section 2.1, and as shown on the cross-sections on Figures 1-3 through 1-5. The Contractor will prepare a Groundwater Dewatering Plan according to the accompanying Construction Documents (*MACTEC, 2007c*) for Trust approval. Dewatering will include surface water, groundwater and water associated with tidal influence, seawater and storm water leaking from the 72-inch storm drain traversing the Building 231 RU. The Contractor will pump water from the excavations using trash pumps into high volume storage tanks used to store pumped water; the tanks will be outfitted with baffles to filter sediments (see Figure 1-2 for location of tanks).

When the excavation reaches the depth of static groundwater level, the Contractor will pump groundwater from the excavation to provide access for excavation of contaminated soil below the water table, and maintain the integrity of in-situ material. The Contractor's dewatering plan should control surface water and groundwater flowing toward or into the excavation to prevent the sloughing of the excavation sidewalls and/or slopes and to eliminate interference with the orderly progress of excavation.

Although not anticipated based on site investigation data, if hydrocarbon 'free product' is encountered during excavation, the Contractor will use absorbent pads and/or booms to remove free product floating on the groundwater surface prior to diverting or pumping the water into an onsite storage tank(s). The absorbent pads and/or booms will be stored in drums and disposed of as hazardous waste. If large volumes of free product are encountered, a vacuum truck will be used to vacuum up the floating product prior to dewatering, sampling an offsite disposal at a permitted facility.

The Contractor will coordinate with the Trust's utility department regarding discharge of water generated during dewatering activities to the sanitary sewer. MACTEC will collect water samples to be analyzed in accordance with the Trust's industrial wastewater permit issued by the City of San Francisco Publicly Owned Treatment Works (POTW) to determine if the water meets discharge requirements. If the collected water does not meet POTW discharge requirements (e.g., water with free product), the Contractor will either treat the water until POTW discharge requirements are met, or transport and dispose of the water at a Trust approved off-site facility. Under no circumstances will collected water be diverted or discharged to the Crissy Marsh or the storm drain system. If the sanitary sewer system does not have the capacity to handle additional collected water due to heavy rains, the Contractor will be prepared to dispose of the wastewater off-site at a Trust-approved off-site disposal facility upon direction.

3.2.6.3 Soil Confirmation Sampling

MACTEC will collect soil confirmation samples from excavated areas to document that soil remaining in the excavation does not exceed cleanup levels identified in Table 1-1. The confirmation soil sampling strategy including procedures, frequency, methods, sample identification and labeling, Quality Assurance/Quality Control (QA/QC), analyses, and data management will be in accordance with the *Presidio-wide Quality Assurance Project Plan* (Presidio-Wide QAPP; *Tetra Tech, 2001*). As excavation is completed in a soil RU, the Contractor will survey the RU excavations and immediate surrounding areas by placing stakes/markers along a 25 foot by 25 foot grid as described in Appendix I (Confirmation Sampling Plan) and shown on Figure I-1. The purpose of the survey is to provide accurate field soil sample locations/excavation dimensions. MACTEC will conduct the confirmation sampling at an excavated RU while the Excavation Contractor performs work in other areas of the Site or proceeds to next soil RU for excavation.

Additional excavation ("over-excavation") may be required based on the results of soil confirmation sampling. The Trust will coordinate with the stakeholders including the Water Board, NPS, and DTSC regarding the excavation progress, results of confirmation samples, and recommendations to over-excavate by holding weekly meetings, or more frequent meetings as needed (See Section 4.4). Confirmation soil sampling and analysis procedures are described below.

Confirmation Soil Sampling Frequency:

Soil samples will be collected from the excavation "bottom" and along the "sidewalls." Bottom sampling will be based on the estimated size of the excavation with a minimum of one sample per 625 square feet (sf) (25 feet by 25 feet). Sidewalls will be sampled at the midpoint of the height of the sidewall (using best professional judgment for biasing sample location to any visible stained soil layers) every 25 feet of its lateral extent or to obtain at least one sample per excavation sidewall. The actual physical dimensions of the excavation will determine the number of bottom and sidewall samples collected. At least one bottom and four sidewall samples will be collected from each excavation.

Confirmation Soil Sampling Methods:

Confirmation soil samples will be collected in accordance with the Presidio-Wide QAPP, specifically SOP No. 001 (*Tetra Tech, 2001*). Soil samples to be analyzed for non-volatile compounds will be collected in clean brass, stainless steel, or butyrate sleeves, covered with Teflon® sheets and plastic end caps, and labeled. Liners will be driven into the sidewall or bottom of each excavation, or into a backhoe bucket containing soil from the target sample location. Samples collected for VOCs will be collected in Encore samplers. For Encore samples, a hand sampler will be driven next to the location of the tube sample. If the soil is composed of pieces of debris, gravel, or very coarse sand that contains void spaces or if rock clasts or debris fragments are larger than the diameter of the Encore sampler, the Encore sampler will not be used and soil samples collected for VOCs analysis will be collected in the stainless steel tube. Samples will be stored in an ice-cooled chest for transportation to a state certified laboratory under chain-of-custody protocols. Each ice-cooled chest will maintain a sample temperature of 4°Celsius (C; ±2°C). If sample analysis is to be delayed or put on hold, the Encore samples will be frozen in the laboratory to prevent the possible loss of VOCs before analysis.

Sample Identification and Labeling:

A sample label will be attached to each sample container. The label will be completed in indelible ink with the project name and Site number, a unique identification number, date and time collected, initials of the sampler, and analyses required. Prior to initiation of sampling, MACTEC will prepare a sampling and analysis plan, which includes sample IDs for approval by the Trust's database manager. Confirmation sample identification will be conducted in accordance with the Presidio-Wide QAPP. Confirmation samples will be identified as follows:

- Site (Building/Location) number (e.g., 230),
- Sample type (e.g., EX=excavation),
- Sequence number (e.g., 301, 302, 303,…) for confirmation samples, and
- Depth in feet below ground surface (e.g., 4.5).

For example, the 4th confirmation soil sample, collected at 6 feet bgs will be labeled as 230EX304[6]. Prior to commencement of sampling activities, the Construction Manager and Engineering Contractor

(MACTEC) will contact the Trust Environmental Database Manager to confirm that soil sample identification numbers utilized during the corrective action implementation are unique to the Presidio.

Quality Assurance/Quality Control (QA/QC) Samples:

The following QA/QC samples will be collected:

- ***Equipment Rinsate Samples.*** Equipment rinsate blanks (RBs) will be collected daily by running distilled water over each sampling device used. However, the total number collected will not exceed 10 percent of the total number of primary samples. Per the Presidio-Wide QAPP, equipment rinsate blank identification will be derived by combining the following symbols: the identification number of the sample collected before the blank, the identifier "RB", and a shortened identification of the sample collected after the blank (e.g., a rinsate blank collected after location collected after location 230EX301 and before 230EX302 would have a designation of 230EX301RB302).

- ***Field Duplicate Samples.*** Per the Presidio-Wide QAPP, field duplicate samples will be collected at a frequency of one for every 10 samples of the sample matrix. Field duplicate samples will be labeled DUP plus the date (i.e., DUP100806 would represent a duplicate sample collected on October 8, 2006). If more then one field duplicate is collected on the same date, a suffix (i.e., "-1" or "-2") will be used to maintain unique sample identification numbers.

- ***Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples.*** Per the Presidio-Wide QAPP, MS/MSD samples will be identified using the primary field sample location identification plus "MS" or "MSD" (i.e., 230EX301MS or 230EX301MSD). One MS/MSD sample will be collected per every 20 samples of the same matrix.

Sample IDs to be used for other types of samples to be collected during the corrective action activities is presented in Appendix I.

Chain-of-Custody Records:

Chain-of-custody records provide an accurate written record that tracks the possession of individual samples from the time of collection in the field until they are accepted at the laboratory. The chain-of-custody record also will be used to document the samples collected and the analysis requested. The Construction Manager and Engineering Contractor will record the following information on the chain-of-custody record: Project name and number; name and signature of sampler; destination of samples (laboratory name); sample identification number; sample location, description, and depth (where applicable); date and time of collection; number and type of containers filled; analysis requested; preservatives used (if applicable); filtering (if applicable); signature of individuals involved in custody transfer (including the date and time of transfer); laboratory purchase order number; air bill number (if applicable); and relevant remarks related to sample analysis (such as samples selected for MS/MSD analysis).

Per the Presidio-Wide QAPP requirements, a copy of the chain-of-custody record will be delivered to the Trust Project Manager as soon as possible after sampling. An example chain-of-custody record is included in Appendix G (Example Field Forms).

<u>Confirmation Soil Sampling Documentation:</u>

Confirmation sample locations will be sketched in the field notes. Confirmation sample locations that meet cleanup levels will be accurately mapped with the limits of the excavation. Soil confirmation sample locations will be surveyed in the field.

For all samples collected at the Site, sample tracking documents will be prepared so that chain-of-custody records can be maintained and sample disposition can be controlled. Sample identification documents will include a Daily Field Log, a sample label, and chain-of-custody records. The Construction Manager and Engineering Contractor (MACTEC) will prepare these records during each sampling activity. Section 4.1 describes the content of the Daily Field Log that will be prepared specific to the project, and a chain-of-custody record is included in Appendix G (Example Field Forms).

<u>Confirmation Soil Sampling Analysis:</u>

All confirmation samples will be analyzed for one or more of the following COCs identified for each of the Soil RUs described in Appendix I (Confirmation Sampling Plan)

- PAHs by Environmental Protection Agency (EPA) Method 8270-SIM;
- TPH as gasoline, diesel, and fuel oil by EPA Method 8015 modified and EPA Method 3630A - Silica Gel Cleanup;
- BTEX/MTBE by EPA Method 8015/8021;
- Pesticides and PCBs by EPA Methods 8081 and 8082; and
- Metals (e.g., arsenic, cadmium, chromium, copper, lead, nickel, zinc) (EPA 6000-7000 series).

The goal of the confirmation sampling is to demonstrate removal of soil contamination associated with petroleum-related releases. As described above in Section 2.1.6, portions of the soil RUs may not be over-excavated to meet cleanup levels due to physical structures or the adjacent Fill Site 6B Therefore, confirmation sampling of excavation bottoms and/or sidewalls in any areas that do not achieve cleanup levels will be conducted to provide a record of potentially remaining contamination.

<u>Data Validation and Data Management:</u>

MACTEC will obtain analytical data directly from the laboratory and will perform a cursory review of the chemical data (EPA Level II validation) and QA/QC data prior to consulting with the Trust and agencies regarding the need to continue excavation or begin backfilling. The purpose of the cursory review is to identify any significant QC failures or elevated detection limits that would affect decisions regarding whether the data are sufficient to show that COCs are not present in confirmation soil samples at concentrations greater than cleanup levels. Preliminary analytical data will be screened against cleanup levels and cleanup level exceedances identified. Tables of preliminary data will be prepared and presented in weekly stakeholder meetings described in Section 4.4.

Level III and Level IV data validation will be performed after hard copies of the raw data packages are received from the laboratory. Validation will be performed and qualifiers will be applied to analytical results in accordance with the Presidio-Wide QAPP, US Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Organic Data Review, and US Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Inorganic Data

Review. The results of the Level III and Level IV data validation will be presented in the Construction Completion Report.

Pertinent chain of custody information and analytical data (obtained electronically from the laboratory) will be loaded into MACTEC's database and the Presidio's data base. Survey data (northing and easting coordinates) for the confirmation samples and data validation qualifiers will also be loaded into both data bases. Database reports of Level III validated analytical data will be generated from MACTEC's database for presentation in the Construction Completion Report.

3.2.6.4 Stockpile Management and Profiling

Figure 1-2 depicts the location of the stockpile staging area. The Contractor will manage the stockpiles in accordance with Section 3.1.7.

For profiling, the Contractor will:

- Profile soil for disposal as described below:
    - The Trust will provide the Contractor soil analytical data from excavation confirmation samples;
    - The Contractor will collect additional samples from stockpiles as required by the landfill to profile the soil for disposal with each soil sample uniquely identified in accordance with Trust sample designation guidelines;
    - Chemicals of concern (COCs) and associated analytical methods identified in one or more of the RUs include the following:
        - Total petroleum hydrocarbon as gasoline (TPHg) by EPA Method 8015 modified;
        - Total petroleum hydrocarbon as diesel (TPHd) and total petroleum hydrocarbon as fuel oil (TPHfo) by EPA Method 8015 modified, prepared with Silica Gel Cleanup, EPA Method 3630A;
        - BTEX/MTBE by EPA Method 8015/8021;
        - PAHs by EPA Method 8310 or 8270-SIM;
        - Pesticides and PCBs by EPA Methods 8081 and 8082; and
        - Metals (e.g., arsenic, cadmium, chromium, copper, lead, nickel, zinc) (EPA 6000-7000 series).
- Determine the location/method of disposal based on waste profile results and approval from the Trust. All material will be disposed or recycled offsite.
- Recyclable materials transported offsite will be surface-cleaned using dry methods (such as a broom), and transported and disposed of offsite as appropriate.
- Submit completed manifests profiles and backup materials (e.g., test results and sampling method) to the Trust for review and signature at least five days prior to scheduled loading for offsite disposal.

Alternatively, the Contractor may choose to pre-profile the soils within the planned excavation areas to allow for direct loading onto haul trucks.

3.2.6.5 Soil Off Hauling

The actual volume of soil transported and disposed of offsite will depend on the amount of soil excavated and the results of confirmation sampling. Approximately 23,000 cubic yards of material is estimated to be excavated and will require disposal from the four RUs.

The Contractor may elect to mix soil from all or some of the RUs for disposal or dispose of individual RU soil separately provided disposal facility waste profile requirements are met. All material will be disposed or recycled offsite at a Trust approved disposal facility.

The Contractor will evaluate disposal options at Class 1, 2, or 3 landfills by assessing the mixture of contaminants and associated concentrations measured in the excavated soil. The excavated soil is anticipated to be acceptable at a Class 2 or 3 landfill; no Class 1 material is anticipated based on previous site characterization data.

After soil profiling is completed and the Trust approves a disposal facility, the Contractor will load soil into trucks operated by a licensed, Department of Transportation (DOT)-approved transportation contractor who will transport the material under a non-hazardous bill of lading or hazardous waste manifest (whichever is appropriate) directly to the disposal facility. The disposal facility will provide a certificate of receipt for each load of material as well as a weight receipt. Hauled materials will be fully covered during transport. The Contractor will provide the Trust copies of the certificates of receipt weekly, which will be documented in the Construction Completion Report.

Proposed truck haul routes are shown on Figure B-1 of Appendix B (Truck Haul Routes Plan), and are summarized as follows.

- Enter the Presidio through the Gorgas Gate or Richardson Slip Ramp
- Follow Gorgas Avenue or Richardson Avenue respectively to the Site
- Turn right on Marshall Street and proceed to the staging area at the corner of Marshall and Mason
- Enter site through gate on a temporary construction fence along Marshall Street
- Loaded trucks will exit the Site east on Gorgas Avenue
- Turn north on Marshall street
- Turn east on Mason Street
- Turn south on Marina Boulevard
- Turn west on Doyle Drive to Highway 101 to offsite disposal facilities.

3.2.6.6 Contingency Actions

Although not expected, the following contingency actions have been developed to minimize disruptions in the event they should occur.

USTs and Associated Piping: If excavation uncovers a previously unidentified UST and/or associated piping, the Trust will comply with applicable State and local regulations for UST and/or associated piping removal. The Contractor will stop work in the area and notify the Trust and Construction Manager, but may continue work in other unaffected portions of the Site as appropriate. The Trust will obtain the appropriate removal permit from the County and/or hire an appropriate contractor to remove the UST and/or associated piping, and associated petroleum hydrocarbon-impacted material, under City and County of San Francisco Department of Public Health and San Francisco Fire Department oversight in accordance with standard procedures at the Presidio. The Contractor will resume work in the area upon authorization from the Trust.

Pipelines: In the event that excavation uncovers an unanticipated underground utility pipe, the Contractor will determine if the line is active or inactive. If the line is an active utility, the Contractor will attempt to support the utility during the excavation activities and maintain its integrity. If the line is determined to be inactive, the Contractor will remove the pipeline. If the pipeline is identified as a conduit for petroleum hydrocarbons associated with a UST or if contamination is identified by staining, odor, and/or organic vapor measurement (OVM) readings, the Contractor will remove as much of the pipe as possible as directed by the Trust.

Drums or Other Containers: In the event that excavation uncovers drums or other containers containing liquids, the Contractor will stop work in the area and contact the Trust and Construction Manager, but may continue work in other unaffected portions of the Site as appropriate. If encountered, the Trust or its contractor will handle the drums or containers in accordance with the Site-specific HASP and applicable laws and regulations and will sample their contents. The Trust will coordinate removal and disposal of the drum or other containers.

If the drums or other containers are found to not have contained a hazardous material, the Trust will direct the Contractor to remove the drums in accordance with standard procedures at the Presidio. Drums or other containers removed from the Site will be placed in lab-packs, overfill drum, or other suitable containers for transportation and off-site disposal if necessary.

If the drums or containers contain hazardous materials, the Trust will coordinate their disposal with the Contractor.

Asbestos-Containing Materials: With the exception of some construction materials that may be present in Building 231 that will be demolished prior to excavation, the presence of asbestos containing materials (ACMs) is considered unlikely at the Site. In the event that ACMs are encountered during excavation, the Contractor will stop work in the area and contact the Trust and Construction Manager, but may continue work in other unaffected portions of the Site as appropriate. ACM will be handled in accordance with the Site-specific HASP and all applicable laws and regulations, as well as any applicable requirements of the Presidio's Asbestos Operation and Maintenance Program (*HES, 2000*). The Trust will coordinate removal of the ACM with an appropriate environmental in accordance with the Presidio's Asbestos Operation and Maintenance Program.

Unexploded Ordnance: Although it is unlikely that any unexploded ordnance (UXO) will be found within, or in the vicinity of the Site UXO has been discovered in other unexpected locations at the

Presidio. MACTEC and The Trust will discuss guidelines for recognizing UXO with all contractors during the kick-off meeting. These guidelines will be consistent with the NPS Golden Gate National Recreation Area (GGNRA) SOP regarding potential UXO discovery procedures (*GGNRA, 2004*).

If UXO is discovered during the course of the work, the Contractor will stop work in the area and notify the Trust and Construction Manager, who will coordinate a response with Park Dispatch and all other interested parties. The Contractor will resume work only upon authorization from the Trust Project Manager.

3.2.7 Excavation Record Survey

After the Trust approves excavation completion and prior to backfilling, the Contractor will perform an excavation record survey for each RU. The survey will include:

1. RU excavation elevations at the toe of the excavations and at the top of the excavations;
2. Lateral extent of excavation;
3. Lines and levels of exposed utilities during excavation;
4. Limits of LUCs (defined by the toe of the excavation and the limits of the soil RU depicted on Figure 1-8) within each RU.
5. Lines and levels of subsurface structures (e.g., utilities, etc.) encountered during (1) demolition of Building 231 and the above-ground soil vapor extraction (SVE) system equipment adjacent to the building; and (2) excavation activities (including below-ground piping associated with the SVE system that will be removed during excavation).

The survey will be based on the same horizontal and vertical control datums described under Section 3.1.9 used during the pre-construction site survey. The Contractor will use this survey to calculate the volume of soil excavated from each RU.

3.2.8 Backfilling and Grading

This section describes backfill and grading procedures and requirements; detailed Contractor specifications are provided in the accompanying Construction Documents (*MACTEC, 2007c*).

3.2.8.1 Backfill Material Specifications

Import Fill for Soil RU Backfill: After the excavation survey is completed and upon stakeholder approval, the Contractor will backfill the excavations with natural sand. This material will be used to backfill to final grade as follows:

1. Building 231 RU, south of Gorgas Avenue (excluding the areas where the asphaltic concrete trail is to be constructed);
2. Building 207 RU to the north of North Doyle Drive; and
3. Building 38 RU portion to the north of North Doyle Drive.

The material will also be used to backfill to the bottom of the Class II aggregate base to be placed below asphalt pavement in areas, which are to be restored to paved finish surface at:

1. Building 230 RU;
2. Gorgas Avenue and Halleck Street sections of Building 231 RU;
3. Building 208 RU; and
4. Building 38 RU portion to the south of North Doyle Drive.

Prior to using the import fill for backfilling:

- The Contractor will identify sand and smaller sized fractions import fill sources satisfying criteria specified above.
- Before import fill is brought to the Site, the Contractor will collect potential import fill material samples for laboratory analysis; the Contractor will submit an import fill certification form to document the physical (sieve analysis) and chemical (analytical testing) data for NPS and stakeholders to review and approve.
- MACTEC will provide the Contractor with an analytical suite consistent with DTSC Information Advisory Clean Imported Fill Material (*DTSC*, *2001*) and Water Board Order No. R2-2003-0080, and provide guidance regarding sample collection and QA/QC procedures in accordance with the Presidio-Wide QAPP (*Tetra Tech*, *2001*). The Contractor is responsible for collecting the samples and submitting them for analysis.
- The Contractor will submit samples for analysis at a minimum for TPHg, TPHfo, TPHd, and BTEX using EPA Test Method 8015 and Title 22 metals using EPA Test Method 6010C and EPA Test Method 7471A for mercury. If the proposed backfill material is from an agricultural source, samples will also be analyzed for pesticides and herbicides by EPA Methods 8081A, 8141A, and 8151A. Additional analyses may be required based on the source of the imported backfill material.

MACTEC will compare chemical concentrations detected in samples of potential backfill to the Site soil cleanup levels and requirements for backfill material specified in the Water Board Order No. R2-2003-0080. The Trust will not accept soil with chemical concentrations above soil cleanup levels or that does not meet the requirements of the Water Board Order No. R2-2003-0080 or DTSC guidelines as backfill material. The Trust in collaboration with NPS will approve material properties of the backfill material prior to its use.

The following compaction criteria will apply for the various types of backfill proposed for use on site:

Type of Backfill	**Soil Type**	**Compaction Criteria**
Backfill to Final Surface – Building 231 RU (Except Gorgas Avenue), Landscape Portions of Building 38 RU and 207 RU	Natural Sand	No Compactive Effort

Type of Backfill	**Soil Type**	**Compaction Criteria**
Backfill to Bottom of Subgrade – Gorgas Avenue and Parking Lot Portions of Building 38 RU, Building 230 RU, and Building 207 RU	Natural Sand	90% Minimum, 1 test for each 8-inch loose lift, 100 square yards
Utility Trench to Surface– Building 231 RU (Except Gorgas Avenue), Landscape Portions of Building 38 RU and 207 RU	Natural Sand	90% Minimum, 1 test for each 8-inch loose lift, 100 foot of Trench
Utility Trench to Bottom of Subgrade– Gorgas Avenue and Parking Lot Portions of Building 38 RU, Building 230 RU, and Building 207 RU	Natural Sand	90% Minimum, 1 test for each 8-inch loose lift, 100 foot of Trench
Subgrade Below Pavement	Class II – Aggregate Base	95% Minimum, 1 test for 8-inch loose lift, 100 square yards

3.2.8.2 Final Site Restoration of the RUs

Building 230 RU, Building 207 RU, and Building 38 RU Portion to the South of Northern Doyle Drive Overpass: The Contractor will backfill and grade the surface to match adjacent grades and pre-construction contours, allowing for pavement replacement. Replacement pavement will match pre-construction drainage patterns.

Building 207 RU and Building 38 RU Portion to the North of Northern Doyle Drive Overpass: The Contractor will backfill and grade the surface to match adjacent grades and pre-construction contours, allowing for revegetation. Final grades and surface finish will be restored to match pre-construction drainage patterns.

Building 231 RU to the South of Gorgas Avenue:

The Trust, NPS, and their resource groups have identified there is value in restoring a portion of the Site in a manner that would visually serve to acclimate the public to the appearance of below-existing-grade "natural" topography and wetlands vegetation for this area that will eventually be restored to wetlands. Therefore, the Building 231 RU will be partially backfilled and rough graded to provide a suitable planting area for willows or a similar type of plant.

Building 231 RU backfill will be graded with minimal slope (approximately 0.5 percent) to facilitate maximum storm water infiltration through the sand backfill material, minimize erosion, and provide a suitable surface for the Trust to implement their post-construction site use as a Propagule Planting Area (see Section 3.3.3). Drainage will be provided through the installation of a drain inlet and a storm drain pipe that discharges groundwater that may rise above the final grade (in late winter and early spring based on historic groundwater elevation data) and storm water to an existing 72-inch storm drain that traverses through the Building 231 RU. However, prior to discharging groundwater to the storm drain, MACTEC

will collect one surface water sample (and one duplicate sample; if and when surface expression of groundwater is observed) and test the sample for the RU-specific COCs. If COC concentrations are above the surface water criteria established for the Site, then the RU will be backfilled to historic high groundwater elevations in the area.

Figure 2-1 illustrates historical high groundwater elevation data for the shallow groundwater monitoring zone within the Building 231 Area, and shows interpolated high groundwater elevations (for reference purposes) in parts of the RU where there are no monitoring wells. The proposed final grade for the Building 231 RU is shown on Figure 3-3 and cross sections through the Building 231 RU are shown on Figure 3-3. The cross-sectional view is presented on Figure 3-4 (see Appendix J for design basis, assumptions, and calculations).

Storm water run-on into this area will be limited through the construction of curbs along Halleck Street (along the western boundary) and Gorgas Avenue (along the Northern Boundary). The existing Building 230 limits the storm run-on from the east, and the historic wall between Building 228 and the Building 231 RU area limits the storm water run-on from the south.

Gorgas Avenue Portion of Building 231 RU: The Contractor will replace the existing 36-foot wide section of Gorgas Avenue within the RU with a 28-foot wide two-way road, a six-inch high concrete curb, and a five foot wide raised pedestrian trail after excavation activities are complete. The Contractor will build a pedestrian trail along the southern edge of the Gorgas Avenue replacement section from Halleck Street and extend it around the perimeter of the Building 231. New crosswalk striping will be painted where the pedestrian trails meet Halleck Street to the west and Marshall to the west (Figure 3-3).

3.2.9 Utility Replacement

The Contractor will replace utilities removed and/or damaged during excavation in accordance with the standards identified in the accompanying Construction Documents (*MACTEC, 2007c*). The utilities that will be replaced following completion of excavation are:

1. Water line on Gorgas Avenue to the north west of Building 230 and serving Building 230, located within the Building 231 RU;

2. Sanitary sewer line through the Building 231 RU; and

3. Storm drain inlet and line to the existing 72-inch storm drain in the Building 231 RU to provide ongoing drainage of the Propagule Growing Area (see Section 3.2.8.2).

Other utilities, if damaged during construction, will be replaced by the Contractor in accordance with the Trust and NPS requirements. MACTEC will develop the specifications for this work, if required, in consultation with the Trust and the NPS.

3.3 Post-Construction Activities

This section identifies general corrective action post-construction activities and sequencing:

- Contractor demobilization

- Post-Construction Contractor Submittals

- Building 231 RU Planting (by Trust)

- Post-Construction Groundwater Monitoring (by T&R)
- Post-Construction Erosion Control Monitoring (by MACTEC)
- In Situ Soil Confirmation Sampling in the northern portion of the Building 228 RU (by MACTEC).

3.3.1 Contractor Demobilization

Following completion of construction activities, the Contractor will demobilize from the Site. Final inspection will be conducted by MACTEC, the Trust, and the NPS in accordance with Presidio programmatic agreements.

Prior to demobilization, the Contractor will:

- Remove all temporary structures (e.g., sanitary facilities, office trailers, etc.);
- Place post-construction erosion control measures in areas backfilled with import fill to grade in areas without an AC pavement surface finish.

3.3.2 Post-Construction Contractor Submittals

The Contractor will submit all post-construction submittals within 30 days of completion of work. These submittals include the following:

1. Excavation record topographic survey
2. Final grade survey
3. Lines and levels of new utilities installed following excavation
4. Locations of exposed underground utilities and structures
5. As Built Plans, documenting any field changes from the Construction Drawings included in the accompanying Construction Documents (*MACTEC, 2007c*)
6. Geotechnical test reports confirming compliance with compaction criteria.

3.3.3 Building 231 RU Planting

Following the restoration of the Building 231 RU (bounded by Gorgas Avenue to the north, Building 230 to the east, the historic wall to the south, and Halleck Street to the west) to the grades shown on Figure 3-3, the Trust will plant willow plants and/or other suitable vegetation. The proposed name for this area is the “Propagule Growing” Area.

3.3.4 Post-Construction Erosion Control Monitoring

Following the completion of backfilling, grading, and restoration activities, the straw wattles placed around the drain inlets in paved areas will be removed. In unpaved areas (i.e., Building 271 RU, Building 38 RU to the north of North Doyle Drive, and Building 231 RU to the South of Gorgas Avenue and West of Halleck Street), surface erosion control measures will be deployed until vegetation gets substantially established. The erosion control measures to be placed may include one or more of the following:

1. Biodegradable surface erosion control fabric to be placed on the backfilled unpaved area; and
2. Straw wattles around the backfilled unpaved areas to prevent storm water runoff containing.

MACTEC will conduct site inspections as required for a period of one year of post-construction monitoring on behalf of the Trust . During the winter season, weekly monitoring is anticipated, and monthly monitoring is anticipated during the remainder of the year.

3.3.5 Building 230 HydroPunch Sampling

MACTEC will collect groundwater samples from the fills and shallow sand following completion of excavation and prior to backfilling the Building 230 RU. Two borings will be drilled in the backfilled area and one HydroPunch sample will be collected from each boring; the samples will be analyzed for the COCs listed in Table 1-1 for RU-specific soil COCs. If COC concentrations are reported above cleanup levels in these samples, MACTEC in consultation with the Trust, NPS, and Water Board, will collect additional samples from the intermediate sands.

3.3.6 Post-Construction Well Installation and Groundwater Monitoring

T&R will install six new groundwater monitoring wells utilizing a California state licensed geologist and driller in accordance with Water Board requirements. The new wells will be located so that each RU will have one or more wells in a downgradient location. One of the new wells (New Well 1) will be installed during pre-construction activities as described in Section 3.1.1. The other new wells will be installed using a procedure similar to that for New Well 1 (See Section 3.1.1). All six new wells and the existing wells will be included in the post-construction groundwater monitoring program for the analytical program summarized in Table 2-1, and their proposed locations are shown on Figure 1-8. T&R will monitor the wells to assess post-construction remedy effectiveness and achievement of cleanup levels. Monitoring results will be included in MACTEC's Construction Completion Report as described in Section 5.0.

3.3.7 Post ORC Advanced™ Injection Confirmation Sampling at Building 228 RU

As recommended in the CAP, and described in Appendix E, approximately two years after the oxygen release product injection has been implemented, direct push technology (DPT) will be utilized to collect in situ soil and groundwater samples within the northern portion of the Building 228 RU to evaluate the residual concentrations of petroleum-related COCs in soil, as well as arsenic and redox parameters in groundwater. MACTEC will prepare a separate work plan addendum for review and approval by the Water Board prior to implementation as summarized in Section 5.0.

As recommended in the CAP, the effectiveness of the in situ injection of ORC Advanced™ in reducing groundwater COCs below cleanup levels will be assessed quarterly under the groundwater monitoring program over a 2-year period following injection. In situ DPT confirmation sampling will then be conducted at 12 locations within the RU to assess whether concentrations of COCs in soil and groundwater within this RU are below cleanup levels. The need for additional injection or implementation of other technologies consistent with mitigating or preventing migration of groundwater containing COCs above cleanup levels will also be assessed. Details regarding the need for, implementation, and duration of these contingencies would be described in a supplemental report based on the results of post-injection groundwater monitoring and DPT confirmation sampling. If sampling

results indicate concentrations of COCs are below cleanup levels, it is assumed that 'clean closure' of this portion of the Building 228 RU would be obtained.

4.0 CONSTRUCTION DOCUMENTATION

This section describes the documents and protocols that will be used during implementation of the construction aspects of the corrective actions described in this Work Plan.

4.1 Daily Logs

A Daily Field Log will be developed specific to the project, and will be maintained by the Construction Manager and Engineering Contractor (MACTEC) during corrective actions activities that will document Site activities, any problems that occur, and corrective measures implemented through the day. An example Daily Field Log is included in Appendix G (Example Field Forms). The Construction Manager and Engineering Contractor will prepare a chronological daily summary report that includes (at a minimum) the following information:

- Date, name of project, and location;
- Weather and Site conditions;
- Onsite personnel and visitors;
- Summary of any meetings conducted and the decisions made during the meetings (separate meeting minutes will be prepared by the Trust);
- Location of daily construction activities, equipment used, and progress made;
- Type, volume, and location (area excavated from and stockpile location) of materials excavated;
- Location of samples collected including excavation areas where the results of soil confirmation samples are above or below cleanup levels;
- Description and quantity of materials received at the Site and the condition in which they were received;
- Description and quantity of materials hauled offsite;
- Identification of construction problems and their solution or disposition; and
- Health and safety considerations.

4.2 Photographic Documentation

Photographs will be taken throughout the corrective action implementation activities. Photographs will be filed in chronological order and will be labeled and indexed to note date and time, photographer name, location, orientation, and a brief description. Photographs will cover all aspects of the Site work during pre-construction, construction, and post-construction activities. A blank photograph log is included in Appendix G (Example Field Forms).

4.3 Progress Reports

MACTEC will provide weekly construction monitoring progress reports to the Trust during excavation activities. These weekly reports will describe construction work accomplished, work remaining, any schedule variances, and highlight issues that may arise to impede the progress of the project, and will be included as an appendix to the Construction Completion Report described in Section 5.0. More frequent reports will be prepared as necessary to document ongoing data management and decisions made in field.

4.4 Meetings

Tailgate meetings will be held at the Site during construction activities and will be attended by MACTEC, the Trust's corrective action contractors performing work at the Site, and other parties as necessary depending on the work to be completed that day. The daily meetings will focus on health and safety issues or concerns, a review of the work performed the previous day, and the work to be performed during the current day.

During excavation activities, progress meetings will be held weekly, or as needed, at the Trust's office and be attended by the Trust, Excavation Contractor, Construction Manager, Engineering Contractor, and other parties (Water Board, NPS, and DTSC) as necessary. The Construction Manager and Engineering Contractor will keep the Trust informed of the progress of the corrective actions, and the Construction Manager will coordinate all work and contractors, under the oversight of MACTEC.

The Trust will communicate the status of the project, confirmation sampling results, recommendations for over-excavation and other project issues to the Water Board, NPS, and other stakeholders. Additional meetings are anticipated to include kick-off meetings, site walks, and one meeting after excavation work is completed. An agenda will be prepared and faxed out the day before each meeting (except for informal meetings) by the Trust. Meeting minutes will be prepared by MACTEC.

5.0 REPORTING AND CORRECTIVE ACTION IMPLEMENTATION DOCUMENTATION

This section identifies the reporting mechanisms and documentation involved with each of the corrective action components that will be implemented at the Site. The Trust's contractors are shown in parentheses if known at this time. A Five-Year Status Report will be completed and submitted to the Water Board that summarizes the status of the corrective actions at the five RUs at the Site five years after construction is completed. It is anticipated that the first report will be submitted in 2013.

5.1 Groundwater Monitoring Well Abandonment, Installation, and Monitoring

- ***Contracting—***Groundwater Monitoring and Well Abandonment/Installation Contractor (Treadwell & Rollo, Inc. [T&R]);

- ***Planning***—This Work Plan;

- ***Documentation***—Progress reports prepared by the Groundwater Monitoring and Well Abandonment/Installation Contractor for the Trust;

- ***Closure / Follow Up Reporting—***An appendix to the Construction Completion Report will be prepared using data obtained by the Groundwater Monitoring and Well Abandonment/Installation Contractor that summarizes the groundwater monitoring data, that will also be included in the Trust's *Semi-Annual Groundwater Monitoring Report, Presidio-Wide Quarterly Groundwater Monitoring*. For the new well installed downgradient of the Building 228 RU, MACTEC will obtain pre-construction groundwater data from T&R regarding installation, development, and sampling of the new monitoring well, and will evaluate the data in regard to oxygen releasing compound application decision-making as described in Section 5.1 and Appendix E. MACTEC will prepare the summary of groundwater monitoring data that will be presented in the Construction Completion Report, which will include an evaluation of the groundwater monitoring results. If post-corrective action groundwater data indicates petroleum-related COC concentrations in groundwater are below cleanup levels, the report will document that ongoing monitoring will be performed as described in the CAP. If post-excavation data indicates petroleum-related COCs in groundwater are above cleanup levels, the report will include (1) an assessment of the need for and/or recommendations regarding potential application of in situ oxygen releasing compound; and (2) a description of follow-up reporting that is determined to be necessary by the Trust and Engineering Contractor (MACTEC) in consultation with the Water Board, NPS and other stakeholders.

5.2 Excavation and Offsite Disposal

- ***Contracting***—Excavation Contractor procured by the Trust (to be determined);

- ***Planning and Procurement***—This Work Plan and the accompanying Construction Documents (*MACTEC, 2007c*);

- ***Documentation***—Progress reports prepared by the MACTEC for the Trust;

- ***Closure / Follow Up Reporting***—Construction Completion Report prepared MACTEC.

5.3 Indoor Cap Inspection and Air/Soil Vapor Sampling at Building 228 RU

- ***Contracting***—Building 228 RU Indoor Cap Corrective Action Contractor (EKI);
- ***Planning***—Appendix H of this Work Plan prepared by the Building 228 Indoor Cap Corrective Action Contractor (EKI);
- ***Documentation***—Progress reports prepared by the Building 228 Indoor Cap Corrective Action Contractor (EKI) for the Trust;
- ***Closure / Follow Up Reporting***—An appendix to the Construction Completion Report prepared by the Building 228 RU Indoor Cap Corrective Action Contractor (EKI) that documents the results of the work described in the Appendix H of this Work Plan, including all progress reports, implementation reporting communications, data, and records.

5.4 ORC Advanced™ Injection at Building 228 RU

- ***Contracting***—Building 228 RU ORC Advanced™ Injection Contractor (MACTEC);
- ***Planning***—This Work Plan;
- ***Documentation***—Progress Reports prepared by the Building 228 RU ORC Advanced™ Injection Contractor (MACTEC) for the Trust;
- ***Closure / Follow Up Reporting—***An appendix to the Construction Completion Report prepared by the Building 228 RU ORC Advanced™ Injection Corrective Action Contractor (MACTEC) that documents the results of the work described in the Appendix E of this Work Plan, including all progress reports, implementation reporting communications, data, and records; post-injection Work Plan to be prepared for conducting in situ confirmation sampling and ORC Advanced™ effectiveness assessment; and Summary Report following confirmation sampling.

5.5 Outdoor Cap Inspection at Building 228 RU

- ***Contracting***—Building 228 RU Outdoor Cap Inspection Contractor (MACTEC);
- ***Planning***—This Work Plan;
- ***Documentation***—A summary report prepared by the Building 228 RU Outdoor Cap Inspection Contractor (MACTEC) for the Trust;
- ***Closure / Follow Up Reporting—***Construction Completion Report prepared by the Building 228 Outdoor Cap Inspection Contractor (MACTEC) that documents the results of the work, including all progress reports, implementation reporting communications, data, and records.

5.6 Land Use Controls

- ***Contracting***—Land Use Controls Contractor (MACTEC);

- ***Planning***—This Work Plan;

- ***Closure / Follow Up Reporting*** —An addendum to the LUCMRR; a copy will be included as an appendix to the Construction Completion Report. LUCs will be implemented for (1) portions of soil RUs where excavation will not be performed at this time due to structural constraints, but will be excavated in the future under separate programs when the structural constraints are removed; and (2) groundwater at the Site. It is anticipated that after petroleum-related COCs and arsenic are demonstrated to be below cleanup levels for four consecutive sampling events in groundwater monitoring wells and the newly installed wells, monitoring will be discontinued (subject to Water Board approval), the groundwater LUC will be removed, and clean closure with regards to groundwater contamination will be documented in a Site closure report and a site-specific addenda to the LUCMRR. For the Building 228 RU, the LUC will be documented in the site-specific addenda to the LUCMRR.

5.7 Construction Completion Report

Upon completion of the corrective actions described in this Work Plan, the Engineering Contractor (MACTEC) will prepare a Construction Completion Report. The Construction Completion report will present an overall project summary and findings, and will include the following items:

- Brief introduction and Site history;

- In situ treatment and capping corrective actions;

- Data and groundwater monitoring results related to the oxygen releasing compound injection at Building 228 RU;

- Indoor air data and sampling results, and cap inspection and improvement results related to capping and assessment of potential vapor phase intrusion at Building 228 RU;

- Photographs of work showing the sequence of work;

- QA/QC results for the corrective action implementations; and

- Chemical analyses and reporting (laboratory reports) that comply with the Presidio-Wide QAPP with Level III/IV data validation, data validation reports, and EDDs that comply with Trust's current format.

<u>Groundwater Corrective Actions</u>

- Well abandonment and installation and related survey data (boring logs and monitoring well completion logs for the six new monitoring wells);

- Groundwater monitoring data collected for the project duration (at a minimum, analytical results from the first round of groundwater monitoring from the newly installed groundwater wells and existing wells identified in Table 2-1);

- Photographs of work showing the sequence of work;

- QA/QC results for the corrective action implementations; and
- Chemical analyses and reporting (laboratory reports) that comply with the Presidio-Wide QAPP with Level III/IV data validation, data validation reports, and electronic data deliverables (EDDs) that comply with Trust's current format.

Excavation Corrective Actions

- Material removal procedures including excavation, material segregation, stockpiling, and backfilling;
- Description of observations of excavated materials;
- Equipment utilization;
- Site restoration activities;
- Sampling and laboratory methods and QA/QC procedures; and
- Presentation of the results and Chain of Custody forms for the analytical sampling and analysis of soil and other waste material.

Permits and Inspection Reports

- Survey reports and maps showing pre-construction, excavation record, intermediate backfill (if needed), and final record areas and elevations;
- Drawing(s) showing sample locations;
- Transportation records including bills of lading and hazardous waste manifests;
- Certifications of disposal from disposal facilities;
- Analytical reports of fill materials used to backfill the excavation and location of borrow source; and
- Photographs of work showing the sequence of work.

QA/QC results for the corrective action implementation

- Chemical analyses and reporting (laboratory reports) that comply with the Presidio-Wide QAPP with Level III/IV data validation, data validation reports, and electronic data deliverables (EDDs) that comply with Trust's current format.

Land Use Control Corrective Actions

- A description of proposed LUCs (the Site-specific LUCMRR addendum will be submitted as an appendix to the Construction Completion Report).

6.0 PROJECT SCHEDULE

The Trust's contractors shown on Figure 1-9 will sequence corrective action activities and deliverable submittals in a manner that will ensure the corrective actions are implemented in an orderly, efficient, and safe manner and in accordance with (1) this Work Plan for all corrective action components, and (2) with this Work Plan and the accompanying Construction Documents (*MACTEC, 2007c*) for excavation corrective actions.

For planning purposes, a Construction Schedule through the submittal of the Construction Completion Report and review by the Water Board was developed and is presented on Figure 6-1. The Construction Schedule presents major construction milestones and associated sub-tasks. Some items are tentative and may be modified based on the findings of earlier operations, agency/permitting delays, or contingency operations. The Construction Schedule was developed assuming corrective actions for each RU would be implemented individually in a sequential manner, and presents assumptions for a conservative duration for project completion assuming potential over-excavation activities do not significantly increase the limits of excavation. The Contractor may elect to perform corrective actions for multiple RUs concurrently; however, excavations should be completed to avoid the rainy season and wet conditions. The Construction Completion Report documenting completion of the construction portions of the corrective action will be submitted to the Water Board within three months of construction completion, which is anticipated to be completed by December 2008.

7.0 REFERENCES

Anthropological Studies Center, Sonoma State University and MACTEC (ASC & MACTEC), 2006. *Draft Subsurface Geoarchaeological Survey of the Building 207/231 Area, Presidio of San Francisco, City and County of San Francisco, California*. September.

ASC, 2005. *Draft Workplan for Subsurface Geoarchaeological Survey of the Building 207/231 Area, Presidio of San Francisco, City and County of San Francisco, California*. November.

Department of Toxic Substances Control (DTSC), 1999. *Consent Agreement Between the California Department of Toxic Substances Control, the Presidio Trust, and the US Department of the Interior, National Park Service for the Remediation of Hazardous Substances at the Presidio of San Francisco*. August 30.

______, 2001. *Information Advisory Clean Imported Fill Material.*

______, 2004. *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. December. Revised Feb. 7, 2005.

Erler & Kalinowski, Inc. (EKI), 2004. *Low Temperature Thermal Desorption-Treated Soil Tracking and Management Plan*. November.

______, 2004. *Guidance For The Evaluation and Mitigation of Vapor Intrusion to Indoor Air*.

Golden Gate National Recreation Area (GGNRA), 2004. *Unexploded Ordnance Procedures; Standard Operating Procedure No. 814*. October 24.

Hygienetics Environmental Services, Inc. (HES), 2000. *Final Asbestos Operation and Maintenance Program, The Presidio of San Francisco.*

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006a. *Technical Memorandum, Evaluation of Arsenic and Other Metals in Groundwater at Three Corrective Action Plan Sites, Presidio of San Francisco, California.* June.

______, 2006b. *Draft Subsurface Geoarchaeological Survey, Building 207/231 Area, Presidio of San Francisco, California*. October.

______, 2007a. *Draft Building 207/231 Area Corrective Action Implementation Work Plan, Presidio of San Francisco, California.* November.

______, 2007b. *Final Corrective Action Plan, Building 207/231 Area, Presidio of San Francisco, California*. October.

______, 2007c. *Building 207/231 Area Corrective Action Implementation Construction Drawings and Technical Specifications, Presidio of San Francisco, California.* November.

Presidio Trust (Trust), 2002. *Presidio Trust Management Plan, Land Use Policies for Area B of the Presidio of San Francisco, California*. May.

_____, 2006a. *Presidio Land Use Controls Master Reference Report, Presidio of San Francisco, California.* August.

_____, 2006b. *207/231 Area Corrective Action Plan Guidelines for Protection of Historic Structures and Walls. Memorandum from Christine Wallace, Senior Preservation Specialist, Presidio Trust, to Ryan Seelbach, Presidio Trust Project Manager*. October 16.

_____, 2007. *Request to Proceed with Phase 2 Investigation, Fill Site 6B, Presidio of San Francisco, California*. August 8.

Tetra Tech, 2001. *Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan, Presidio of San Francisco, San Francisco, California*. April.

Treadwell & Rollo (T&R), 2005. *Semi-Annual Groundwater Monitoring Report, Third and Fourth Quarters 2004, Presidio-Wide Quarterly Groundwater Monitoring Program, Presidio of San Francisco, San Francisco, California*. November 30.

TABLES

Table 1-1. Soil Cleanup Levels

	Compilation of Applicable Cleanup Levels											
	Petroleum-Related [b]		Non Petroleum-Related					Freshwater Protection Zones [g]		Saltwater Protection Zones [h]		
				Human Health	Ecological	Ecological	Water Board	Sediment		Sediment		**Lowest Applicable**
	Cleanup Level		Background [c]	(Residential) [d]	(Buffer Zone) [e]	(Special Status) [e]	ESLs [f]	Cleanup Level	Basis for	Cleanup Level	Basis for	**Cleanup Level [i]**
Chemical [a]	(mg/kg)	Basis for Cleanup Level	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	Cleanup Level	(mg/kg)	Cleanup Level	**(mg/kg)**
Total Petroleum Hydrocarbons (TPH)												
TPH as gasoline	100	Water Quality: <5 feet above water table	--	--	--	--	--	140	Freshwater POCC	11.6	Saltwater POCC	**11.6**
TPH as diesel	115	Water Quality: <5 feet above water table	--	--	--	--	--	144	Saltwater POCC	144	Saltwater POCC	**115**
TPH as fuel oil	160	Water Quality: <5 feet above water table	--	--	--	--	--	144	Saltwater POCC	144	Saltwater POCC	**144**
TPH Unknown Diesel Hydrocarbon [j]												
TPH Unknown Gasoline Hydrocarbon [k]												
Polynuclear Aromatic Hydrocarbons (PAHs)												
Acenaphthene	--	--	--	2,700	40	30	--	0.31	Ecological: Freshwater	0.32	Ecological: Marine	**0.31**
Acenaphthylene	--	--	--	--	40	30	--	0.067	Ecological: Freshwater	0.34	Ecological: Marine	**0.067**
Anthracene	308	Water Quality: <5 feet above water table	--	14,000	40	30	--	0.45	Ecological: Freshwater	0.59	Ecological: Marine	**0.45**
Benzo(a)anthracene	0.43	Human health: residential	--	0.27	40	30	--	0.54	Ecological: Freshwater	0.93	Ecological: Marine	**0.27**
Benzo(a)pyrene	0.04	Human health: residential	--	0.027	40	30	--	0.74	Ecological: Freshwater	1.0	Ecological: Marine	**0.027**
Benzo(b)fluoranthene	0.43	Human health: residential	--	0.27	40	30	--	0.79	Ecological: Freshwater	0.79	Ecological: Freshwater	**0.27**
Benzo(b+k)flouranthene, Total	0.43	Human health: residential	--	0.27	40	30	--	0.79	Ecological: Freshwater	0.79	Ecological: Freshwater	**0.27**
Benzo(g,h,i)perylene	620	Human health: residential	--	--	40	30	--	0.25	Ecological: Freshwater	0.25	Ecological: Freshwater	**0.25**
Benzo(k)fluoranthene	0.43	Human health: residential	--	0.27	40	30	--	0.79	Ecological: Freshwater	0.79	Ecological: Freshwater	**0.27**
Chrysene	4.3	Human health: residential	--	2.7	40	30	--	0.67	Ecological: Freshwater	1.6	Ecological: Marine	**0.67**
Dibenzo(a,h)anthracene	--	--	--	0.078	40	30	--	0.071	Ecological: Freshwater	0.16	Ecological: Marine	**0.071**
Fluoranthene	316	Water Quality: <5 feet above water table	--	1,800	40	30	--	1.5	Ecological: Freshwater	2.85	Ecological: Marine	**1.5**
Fluorene	60	Water Quality: <5 feet above water table		1,800	40	30	--	0.28	Ecological: Freshwater	0.28	Ecological: Marine	**0.28**
Indeno(1,2,3-cd)pyrene	--	--	--	0.27	40	30	--	0.26	Ecological: Freshwater	0.26	Ecological: Freshwater	**0.26**
Naphthalene	9	Water Quality: <5 feet above water table	--	910	40	30	--	0.3	Ecological: Freshwater	1.1	Ecological: Marine	**0.3**
Phenanthrene	86	Water Quality: <5 feet above water table	--	--	40	30	--	0.61	Ecological: Freshwater	0.87	Ecological: Marine	**0.61**
Pyrene	241	Water Quality: <5 feet above water table	--	1,400	40	30	--	0.79	Ecological: Freshwater	1.6	Ecological: Marine	**0.79**
Total Carcinogenic PAHs	5.6	Human health: residential	--	--	--	--	--	--	--	--	--	**5.6**
Metals / Inorganics												
Aluminum [l]	--	--	--	76000	--	--	--	--	--	--	--	**76000**
Arsenic	--	--	6.2	0.36	64	10	--	19	Ecological: Freshwater	39	Ecological: Marine	**6.2**
Barium	--	--	180	5,000	500	320	--	3,100	Ecological: Freshwater	3,100	Ecological: Marine	**320**
Beryllium	--	--	0.99	140	10	10	--	7,200	Ecological: Freshwater	7,200	Ecological: Marine	**10**
Cadmium	--	--	0.8	1.7	0.23	0.017	--	1.1	Ecological: Freshwater	1.6	Ecological: Marine	**0.8**
Calcium	--	--	--	--	--	--	--	--	--	--	--	**--**
Chromium	--	--	140	1,200	23	4	--	140	Ecological: Freshwater	140	Ecological: Marine	**140**
Cobalt	--	--	21	4,000	48	20	--	50	Ecological: Freshwater	50	Ecological: Freshwater	**21**
Copper	--	--	49	--	120	30	--	114	Ecological: Freshwater	152	Ecological: Marine	**49**
Cyanide	--	--	--	1,000	13,000	6,300	--	--	--	--	--	**1000**
Iron [l]	--	--	--	23000	--	--	--	--	--	--	--	**23000**
Lead	50	Ecological: Terrestrial 0-3 feet bgs (leaded gas)	7.5	400	300	160	--	82	Ecological: Freshwater	132	Ecological: Marine	**50**
Magnesium	--	--	--	--	--	--	--	--	--	--	--	**--**
Manganese [l]	--	--	--	1800	--	--	--	--	--	--	--	**1800**
Mercury	--	--	0.2	20	1.6	0.4	--	0.62	Ecological: Freshwater	0.43	Ecological: Marine	**0.4**
Nickel	--	--	110	1,400	71	30	--	110	Ecological: Freshwater	110	Ecological: Marine	**110**
Potassium	--	--	--	--	--	--	--	--	--	--	--	**--**
Silver	--	--	1.0	360	2	2	--	1.0	Ecological: Freshwater	2.4	Ecological: Marine	**1**
Sodium	--	--	--	--	--	--	--	--	--	--	--	**--**
Vanadium	--	--	90	650	5	2	--	90	Ecological: Freshwater	90	Ecological: Marine	**90**
Zinc	--	--	60	22,000	50	4	--	230	Ecological: Freshwater	214	Ecological: Marine	**60**
Volatile Organic Compounds (VOCs)												
1,2,4-Trimethylbenzene [l]	--	--	--	52	--	--	--	--	--	--	--	**52**
1,2-Dichlorobenzene [m]	--	--	--	8.9	30	--	1.1	--	--	--	--	**1.1**
1,3,5-Trimethylbenzene [l]	--	--	--	21	--	--	--	--	--	--	--	**21**
1,4-Dichlorobenzene	--	--	--	0.13	74	20	--	0.35	Ecological: Freshwater	0.35	Ecological: Marine	**0.13**
2-Butanone	--	--	--	3.8	15,000	4,200	--	--	--	--	--	**3.8**
2-Hexanone [n]	--	--	--	120	--	--	2.8	--	--	--	--	**2.8**
Acetone	--	--	--	0.24	68,000	8,500	--	--	--	--	--	**0.24**

Table 1-1. Soil Cleanup Levels

Chemical [a]	Compilation of Applicable Cleanup Levels: Petroleum-Related [b] Cleanup Level (mg/kg)	Petroleum-Related [b] Basis for Cleanup Level	Non Petroleum-Related: Background [c] (mg/kg)	Non Petroleum-Related: Human Health (Residential) [d] (mg/kg)	Non Petroleum-Related: Ecological (Buffer Zone) [e] (mg/kg)	Non Petroleum-Related: Ecological (Special Status) [e] (mg/kg)	Non Petroleum-Related: Water Board ESLs [f] (mg/kg)	Freshwater Protection Zones [g]: Sediment Cleanup Level (mg/kg)	Freshwater Protection Zones [g]: Basis for Cleanup Level	Saltwater Protection Zones [h]: Sediment Cleanup Level (mg/kg)	Saltwater Protection Zones [h]: Basis for Cleanup Level	**Lowest Applicable Cleanup Level [i] (mg/kg)**
Benzene	0.005	Water Quality: <5 feet above water table	--	--	--	--	--	0.79	Freshwater POCC	50	Saltwater POCC	**0.005**
Carbon disulfide	--	--	--	200	14,000	934	--	--	--	--	--	**200**
cis-1,2-Dichloroethene[m]	--	--	--	1.6	--	--	0.19	--	--	--	--	**0.19**
Ethylbenzene	13	Water Quality: <5 feet above water table	--	--	--	--	--	15	Freshwater POCC	5	Saltwater POCC	**5**
Methyl tertiary butyl ether[m]	--	--	--	2.0	--	--	0.023	--	--	190	Saltwater POCC	**0.023**
Methylene chloride	--	--	--	0.076	17,000	459	--	--	--	--	--	**0.076**
Tetrachloroethene[m]	--	--	--	0.087	--	--	0.7	--	--	--	--	**~~0.7~~0.087**
Toluene	1	Water Quality: <5 feet above water table	--	--	--	--	--	3	Freshwater POCC	260	Saltwater POCC	**1**
Trichloroethene[m]	--	--	--	0.26	60	--	0.46	--	--	--	--	**0.26**
Xylenes	33	Water Quality: <5 feet above water table	--	--	--	--	--	5.7	Freshwater POCC	22	Saltwater POCC	**5.7**
Xylenes (m&p-)	33	Water Quality: <5 feet above water table	--	--	--	--	--	5.7	Freshwater POCC	22	Saltwater POCC	**5.7**
Xylenes (o-)	33	Water Quality: <5 feet above water table	--	--	--	--	--	5.7	Freshwater POCC	22	Saltwater POCC	**5.7**
Semi-Volatile Organic Compounds (SVOCs)												
Bis(2-ethylhexyl)phthalate[m]	--	--	--	160	--	--	66	--	--	--	--	**66**
Pesticides and PCBs												
4,4-DDD	--	--	--	2.0	0.53	0.049	--	0.016	Ecological: Freshwater	0.011	Ecological: Marine	**0.011**
Arochlor 1016	--	--	--	0.16	0.23	0.033	--	0.36	Ecological: Freshwater	0.10	Ecological: Marine	**0.033**

Notes:

mg/kg	Milligrams per kilogram.
<	Less than.
--	Not available.
POCC	Point-of-compliance concentration.
ESL	Environmental screening level (*Water Board, 2005*).

Checked: MS

Approved: RR

Note: Shaded and bold values are lowest applicable cleanup values.

[a] Only chemicals detected in soil at the Building 207/231 Area are listed.

[b] For petroleum-related constituents, the lowest cleanup levels from Table 5 of the Presidio-Wide Cleanup Level Document (*EKI, 2002* ; Table 7-6 Revised May, 2006) are presented. These cleanup values were adopted by the Water Board in Order No. R2-2003-0080, Presidio-wide Site Cleanup Requirements (*Water Board, 2003*).

[c] Background cleanup values for Colma soil formation from *EKI, 2002* Table 7-2.

[d] For VOCs, the human health (residential) values listed from *EKI, 2002* incorporate groundwater protection concerns from Table 7-2.

[e] From *EKI, 2002* Table 7-2.

[f] The Water Board ESLs are for chemicals that do not have a Presidio-specific cleanup level established. The values listed are from *Water Board, 2005* Table A-1 for "Groundwater Protection (Soil Leaching).'

[g] Sediment values were used in selection of cleanup levels for protection of freshwater ecological receptors. Freshwater and saltwater POCC values are from the *Development of Freshwater TPH-diesel and TPH-fuel oil Point of Compliance Concentrations* (*BBL, 2004*) Table 2.1, and the Ecological: Freshwater values are from *EKI, 2002 (Table 7-6 Revised May 2006)* Table 7-3 buffer zone ecological cleanup levels for Colma formation and Table 7-5 freshwater aquatic organisms.

[h] Sediment values were used in selection of cleanup levels for protection of saltwater ecological receptors. Saltwater POCC values are from *BBL, 2004* Table 2.1 and *Water Board, 2003* (Board Order) Table 6, and the Ecological: Freshwater values are from *EKI, 2002* Table 7-3 and the Ecological: Saltwater values are from *EKI, 2002* Table 7-4 and from the buffer zone ecological cleanup levels for Colma formation.

[i] Cleanup levels used for comparison are lowest of Human Health, Ecological (Buffer Zone), Ecological (Special Status), Freshwater Protection Zone Cleanup Levels, and Saltwater Protection Zone Cleanup Levels. Background used if higher.

[j] TPH as diesel cleanup level value used.

[k] TPH as gasoline cleanup level value used.

[l] ESLs not available for aluminum, iron, manganese, 1,2,4- and 1,3,5-trimethylbenzene, so United States Environmental Protection Agency Region 9 Preliminary Remediation Goals (*USEPA, 2004*) used for cleanup purposes.

[m] ESLs were applied for these chemicals because they do not have a Presidio-specific cleanup level established. ESL values from *Water Board, 2005* Table A-1.

[n] Chemical 2-hexanone does not have an established cleanup level or ESL, so MIBK was used as a surrogate for 2-hexanone, which was selected based upon similar physical properties and limited toxicity data. ESL values from *Water Board, 2005* Table A-1.

Table 1-2. Groundwater Cleanup Levels

Chemical [a]	Compilation of Applicable Cleanup Levels [b,c] Human Health Drinking Water Cleanup Level (µg/L)	Basis for Cleanup Level	Freshwater Toxicity Cleanup Level (µg/L)	Basis for Cleanup Level	Saltwater Toxicity Cleanup Level [d] (µg/L)	Basis for Cleanup Level	**Lowest Applicable Cleanup Levels[e] (µg/L)**
Total Petroleum Hydrocarbons (TPH)							
TPH as gasoline	770	FPALDR	443	Water Board Order	1200	RWQCB Order	**443**
TPH as diesel	880	FPALDR	443	Water Board Order	2200	RWQCB Order	**443**
TPH as fuel oil	1,200	FPALDR	443	Water Board Order	2200	RWQCB Order	**443**
TPH Unknown Diesel Hydrocarbon[f]							**443**
TPH Unknown Gasoline Hydrocarbon[g]							**443**
Polynuclear Aromatic Compounds (PAHs)							
Acenaphthene	--	--	1,200	CTR	--	--	**1,200**
Acenaphthylene	--	--	--	--	--	--	**--**
Anthracene	770	FPALDR	9,600	CTR	--	--	**770**
Benzo(a)anthracene	0.1	Proposed MCL	0.0044	CTR	--	--	**0.0044**
Benzo(a)pyrene	0.2	Federal MCL	0.0044	CTR	--	--	**0.0044**
Benzo(b)fluoranthene	0.2	Proposed MCL	0.0044	CTR	--	--	**0.0044**
Benzo(k)fluoranthene	2	FPALDR	0.0044	CTR	--	--	**0.0044**
Benzo(b+k)flouranthene, Total	0.2	Proposed MCL	0.0044	CTR	--	--	**0.0044**
Benzo(g,h,i)perylene	--150	--FPALDR	--	--	--	--	**--150**
Chrysene	20	FPALDR	0.0044	CTR	--	--	**0.0044**
Fluoranthene	300	FPALDR	300	CTR	--	--	**300**
Fluorene	300	FPALDR	1,300	CTR	--	--	**300**
Indeno(1,2,3-cd)pyrene	--	--	0.0044	CTR	--	--	**0.0044**
Naphthalene	300	FPALDR	--	--	--	--	**300**
Phenanthrene	230	FPALDR	--	--	--	--	**230**
Pyrene	230	FPALDR	960	CTR	--	--	**230**
Total cPAHs	26	FPALDR	0.031	Basin Plan	0.031	Basin Plan	**0.031**
Metals / Inorganics							
Aluminum	1,000	California MCL	--	--	--	--	**1,000**
Arsenic	10	Federal MCL	150	Basin Plan	36	Basin Plan	**10**
Barium	1,000	California MCL	--	--	--	--	**1,000**
Cadmium	5	Federal MCL	1.1	Basin Plan	9.3	Basin Plan	**1.1**
Calcium	--	--	--	--	--	--	**--**
Chloride	250,000	Secondary MCL	--	--	--	--	**250,000**
Chromium	50	California MCL	180	CTR	50	Basin Plan	**50**
Cobalt	140	ESL - Human health	3.0	ESL - Aquatic life	3.0	ESL - Aquatic life	**3**
Copper	1,000	Secondary MCL	9	Basin Plan	3.1	CTR	**3.1**
Iron	--	--	--	--	--	--	**--**
Lead	15	Federal MCL	2.5	Basin Plan	8.1	Basin Plan	**2.5**
Magnesium	--	--	--	--	--	--	**--**
Manganese	--	--	--	--	--	--	**--**
Nickel	100	California MCL	52	Basin Plan	8.2	CTR	**8.2**
Nitrate	10,000	Federal MCL	--	--	--	--	**10,000**
Potassium	--	--	--	--	--	--	**--**
Sodium	--	--	--	--	--	--	**--**

Table 1-2. Groundwater Cleanup Levels

Chemical [a]	Compilation of Applicable Cleanup Levels [b,c]						**Lowest Applicable Cleanup Levels[e] (µg/L)**
	Human Health Drinking Water Cleanup Level (µg/L)	Basis for Cleanup Level	Freshwater Toxicity Cleanup Level (µg/L)	Basis for Cleanup Level	Saltwater Toxicity Cleanup Level [d] (µg/L)	Basis for Cleanup Level	
Vanadium	15	ESL - Human health	19	ESL - Aquatic life	19	ESL - Aquatic life	**15**
Zinc	5,000	Secondary MCL	120	Basin Plan	81	Basin Plan	**81**
Volatile Organic Compounds (VOCs)							
1,1,1-Trichloroethane	200	Federal MCL	--	--	--	--	**200**
1,1,2,2-Tetrachloroethane	1	California MCL	420	ESL - Aquatic life	420	ESL - Aquatic life	**1**
1,1,2-Trichloroethane	5	California MCL	4700	ESL - Aquatic life	4700	ESL - Aquatic life	**5**
1,1,-Dichloroethane	5	California MCL	47	ESL - Aquatic life	47	ESL - Aquatic life	**5**
1,2,4-Trimethylbenzene	--	--	--	--	--	--	**--**
1,2-Dichlorobenzene	600	California MCL	14	ESL - Aquatic life	14	ESL - Aquatic life	**14**
1,2-Dichloroethane	0.5	California MCL	0.38	CTR	--	--	**0.38**
1,2-Dichloroethene (cis & trans)	6	California MCL	590	ESL - Aquatic life	590	ESL - Aquatic life	**6**
1,2-Dichloropropane	5	California MCL	1500	ESL - Aquatic life	1500	ESL - Aquatic life	**5**
1,3,5-Trimethylbenzene	--	--	--	--	--	--	**--**
1,3-Dichlorobenzene	210	ESL - Human health	65	ESL - Aquatic life	65	ESL - Aquatic life	**65**
1,4-Dichlorobenzene	5	California MCL	400	CTR	--	--	**5**
2-Butanone	4,200	ESL - Human health	14,000	ESL - Aquatic life	14,000	ESL - Aquatic life	**4,200**
Acetone	6,300	ESL - Human health	1500	ESL - Aquatic life	1500	ESL - Aquatic life	**1,500**
Benzene	1	California MCL	463	Water Board Order	510	RWQCB Order	**1**
Bromoform	100	California MCL/ESL - Human health	3200	ESL - Aquatic life	3200	ESL - Aquatic life	**100**
Carbon dioxide	--	--	--	--	--	--	**--**
Carbon disulfide	--	--	--	--	--	--	**--**
Chlorobenzene	70	California MCL	680	CTR	--	--	**70**
Chloroform	80	Federal MCL	620	ESL - Aquatic life	620	ESL - Aquatic life	**80**
Chloromethane	1.3	ESL - Human health	3200	ESL - Aquatic life	3200	ESL - Aquatic life	**1.3**
cis-1,2-Dichloroethene	6	California MCL	590	ESL - Aquatic life	590	ESL - Aquatic life	**6**
Ethane	--	--	--	--	--	--	**--**
Ethene	--	--	--	--	--	--	**--**
Ethylbenzene	300	California MCL	845	Water Board Order	43	RWQCB Order	**43**
Methane	--	--	--	--	--	--	**--**
Methyl t-butyl ether	13	California MCL	8000	ESL - Aquatic life	4400	RWQCB Order	**13**
Methylene chloride	5	Federal MCL	4.7	CTR	--	--	**4.7**
sec-Butylbenzene	--	--	--	--	--	--	**--**
Styrene	100	California MCL	100	ESL - Aquatic life	100	ESL - Aquatic life	**100**
tert-Butylbenzene	--	--	--	--	--	--	**--**
Tetrachloroethene	5	Federal MCL	0.8	CTR	--	--	**0.8**
Toluene	150	California MCL	490	RWQCB Order	1000	RWQCB Order	**150**
Trichloroethene	5	Federal MCL	2.7	CTR	--	--	**2.7**
Trichlorofluoromethane	150	California MCL	--	--	--	--	**150**
Vinyl chloride	0.5	California MCL	780	ESL - Aquatic life	780	ESL - Aquatic life	**0.5**
Xylenes	1,750	California MCL	318	Water Board Order	130	RWQCB Order	**130**
Xylenes (m&p-)	1,750	California MCL	318	Water Board Order	130	RWQCB Order	**130**
Xylenes (o-)	1,750	California MCL	318	Water Board Order	130	RWQCB Order	**130**

Table 1-2. Groundwater Cleanup Levels

Chemical [a]	Compilation of Applicable Cleanup Levels [b,c]						Lowest Applicable Cleanup Levels[e] (µg/L)
	Human Health Drinking Water Cleanup Level (µg/L)	Basis for Cleanup Level	Freshwater Toxicity Cleanup Level (µg/L)	Basis for Cleanup Level	Saltwater Toxicity Cleanup Level [d] (µg/L)	Basis for Cleanup Level	
Polychlorinated Biphenyls (PCBs)							
Aroclor 1016	0.5	Federal MCL	0.00017	CTR	0.03	CTR	**0.00017**

Notes:

µg/L	Micrograms per liter.
--	Not available.
MCL	Maximum contaminant level.
CTR	California Toxics Rule.
cPAH	Carcinogenic polycyclic aromatic hydrocarbons.
ESL	Environmental screening level (*Water Board, 2005*).
FPALDR	Fuel Product Action Level Development Report (*MW, 1995c*).

Note: Shaded and bold values are lowest applicable cleanup values.

[a] Only chemicals detected in groundwater at the Building 207/231 Area are listed.

[b] For chemicals for which Presidio-specific cleanup levels have been developed, the cleanup levels were compiled from the Presidio-Wide Cleanup Level Document (*EKI, 2002* ; Table 7-6 Revised May, 2006). For human health, these cleanup levels consist of MCLs or risk-based values developed in the FPALDR (*MW, 1995c*). For freshwater or saltwater toxicity, these cleanup levels consist of Basin Plan values (updated with *Water Board, 2004* : freshwater Table 3-4 and saltwater Table 3-3 from the 4-day average), CTR values, or Water Board Order values (updated with Water Board Order R2-2003-0080 [*Water Board, 2003*]: freshwater Table 7 and saltwater Table 6).

[c] For chemicals for which Presidio-specific cleanup levels have not been developed, the cleanup levels were compiled from ESLs for human health and for freshwater and saltwater toxicity for protection of aquatic life from *Water Board, 2005* Table F-1a.

[d] Values apply to marine or saltwater environments. See footnote b for source information.

[e] Cleanup levels are lowest of Human Health, Freshwater, and Saltwater Toxicity values.

[f] TPH as diesel cleanup level value used.

[g] TPH as gasoline cleanup level value used.

Checked: MS
Approved: RR

Table 1-3. Project Team Responsibilities

Responsible Party	**Responsibilities**		
	Pre-Excavation	**During Excavation**	**Post-Excavation**
Presidio Trust (Owner)	Review Work Plan	Provide Traffic Coordination	Coordinate Groundwater Monitoring and Reporting
	Review Contractor Submittals	Review and Approve Contractor Submittals	Review, approve, and submit Construction Completion Report
	Attend Site Walk with Contractor and Engineer	Provide Resource Group Coordination with stakeholders	Review, approve, and submit LUCMRR Addendum
	Notify Cal Trans, Regulatory Agencies and Resource Groups 2 weeks prior to construction	Conduct weekly meetings and coordination of field data and decisions	Manage Land Use Control Areas
	Solicit and Award Construction Contract	Review and Sign All Manifests	
	Obtain Bay Area Air Quality Management District Demolition Permit, Presidio Excavation Permit, and Sanitary Sewer Waste Water Discharge Permit	Coordination of all contractors and subcontractors	
	Perform Building 231 Hazardous Material Survey; Identify Contractor (TBD) to Perform Building 231 Hazardous Waste Abatement		
	Conduct Project Review with N-Squared Group		
	Coordination of all contractors and subcontractors		

Table 1-3. Project Team Responsibilities

Responsible Party	Responsibilities		
	Pre-Excavation	**During Excavation**	**Post-Excavation**
Engineering Contractor, Construction Manager, Construction Quality Assurance, Outdoor Cap Inspection Contractor (MACTEC)	Prepare Work Plan	Provide Construction Monitoring Documentation During Construction Activities	Prepare Construction Completion Report
	Prepare Construction Drawings and Technical Specifications for Excavation Activities and Building 228 ORC Injection	Provide Design Clarifications and Revisions as Needed	Prepare Record Documents from Contractor As-Builts
	Prepare Building 231 Demolition Plans and Specifications	Provide Construction Management on Behalf of the Trust	Prepare LUCMRR Addendum
	Attend Site Walk with Contractor and Trust	Perform Confirmation Sampling and Data Management	Post-ORC Injection Evaluation and reporting
	Mark Out Limits of Work for Utility Notification	Perform Wastewater Sampling and Data Management	
	Coordinate Topographic Survey	Perform Import Soil Sampling and Data Management	
	Identify Existing Utilities	Review and Submit Laboratory Analytical Results to the Trust	
	Perform Building 228 Outdoor Inspection for Cap Improvements, Reporting		

Table 1-3. Project Team Responsibilities

Responsible Party	**Responsibilities**		
	Pre-Excavation	**During Excavation**	**Post-Excavation**
Excavation Contractor (To be Determined)	Attend Site Walk with Trust and Engineer	Demolish Building 231	Prepare All Close-Out Submittals, Final Record Survey, As-Built Drawings
	Prepare and Submit Construction Management Plan	Site Preparation and Excavate Soil	
	Prepare Environmental Protection Plan	Maintain Working As-Built Drawings for Trust Review	
	Submit HAZWOPER Qualification Certificates	Assist Confirmation Soil and Waste Water Sampling Performed by Engineer	
	Prepare Health and Safety Plan	Provide all Construction Submittals, including Plans, Shop Drawings and Test Reports	
	Prepare Site Plan	Protect the Public, Cultural and Natural Resources	
	Prepare Waste Management Plan	Oversee All Contractor Project Activities	
	Prepare Traffic Control Plan	Submit Waste Soil Manifests and Backup Documents	
	Submit Contractor Contact Information	Implement Construction Documents	
	Submit Pre-Construction Survey Information and Drawings to Trust	Perform Waste Soil Profile Sampling	
	Prepare Demolition Methods Plan	Submit Waybills and Shipping Documents	
	Prepare Excavation and Handling Methods Plan	Identify Potential Import soils	
	Prepare Sampling and Analysis Plan	Perform Soil Testing and Classification	
	Prepare Dewatering Plan	Perform Post Excavation Record Survey	
	Submit Disposal Sites Information and Waste Profiling Forms	Perform Site Restoration	

Table 1-3. Project Team Responsibilities

Responsible Party	Responsibilities		
	Pre-Excavation	**During Excavation**	**Post-Excavation**
Building 228 ORC Injection and DPT Confirmation Sampling (MACTEC)	Inject ORC and Survey Injection Points	Prepare Summary Report	Perform Building 228 In-Situ DPT Confirmation Sampling
		Perform Building 230 In-Situ DPT Confirmation Sampling	
Groundwater Monitoring, Well Abandonment/ Installation (Treadwell & Rollo)	Prepare Technical Specifications for Well Abandonment / Installation	Sample Wells	Sample Wells
	Abandon / Install and Survey Wells, Sample Wells		Prepare Semi-Annual Report
	Review and Submit Laboratory Analytical Results to the Trust; Provide Data to Bldg 228 ORC Injection Contractor		
Building 228 Indoor Cap Inspection / Air/Vapor Sampling (EKI, Inc.)	Prepare Work Plan & Technical Specifications for Sub-slab and Indoor Air Sampling	Perform Indoor Inspection for Cap Improvements, Survey and Sub-Slab Sampling, Indoor Air Sampling	Prepare Summary Report for Inclusion in Construction Completion Report

Table 1-3. Project Team Responsibilities

Responsible Party	**Responsibilities**		
	Pre-Excavation	**During Excavation**	**Post-Excavation**
NPS	Review and Approve Work Plan, Construction Documents (Specifications & Drawings), Conduct 5X review for proposed wells in Area A	Attend Weekly Meetings; consult with Trust & stakeholders on field and over-excavation decisions	Review Construction Completion Report
Water Board	Review and Approve Work Plan	Attend Weekly Meetings; consult with Trust & stakeholders on field and over-excavation decisions	Review Construction Completion Report
DTSC / RAB	Review Work Plan	Attend Weekly Meetings; consult with Trust & stakeholders on field and over-excavation decisions	

Checked: MS

Approved: RR

Table 1-4. Project Team Points of Contact
Building 207/231 Area Corrective Action Implementation Work Plan
Presidio of San Francisco, California

Project Team Member	Name and Title	Address	Phone Number/Email Address
Presidio Trust (Owner)	Ryan Seelbach Project Manager Craig Cooper Remediation Program Manager	Presidio Trust P.O. Box 29052 San Francisco, CA 94129-0052 (Building 67)	(415) 561-5082 (Office) RSeelbach@presidiotrust.gov (415) 561-4259 (Office) CCooper@presidiotrust.gov
Engineering, Construction Manager, Construction Quality Assurance, Outdoor Cap Inspection, Land Use Control Contractor (MACTEC, Inc.)	Ramkishore Rao, P.E. Design Task Manager	600 Grand Avenue, Suite 300 Oakland, CA 94610	(510) 628-3253 Rrao@mactec.com
Excavation Contractor (To be Determined)			
Goundwater Monitoring Contractor (Treadwell & Rollo, Inc.)	Joshua Graber Senior Project Manager	555 Montgomery Street, Suite 1300 San Francisco, CA 94111	(415) 955-9040 jdgraber@treadwellrollo.com
Indoor Inspection/Sampling Contractor (EKI, Inc.)	Michelle King	1870 Ogden Drive Burlingame, CA 94010	(650) 292-9100
National Park Service (NPS)	Brian Ullensvang, P.E. Environmental Engineer	Golden Gate National Recreation Area Fort Mason, Building 201 San Francisco, CA 94123	(415) 561-4726 Brian_Ullensvang@nps.gov
California Water Quality Control Board (Water Board), San Francisco Bay Region (Lead Agency)	Devender Narala, P.E.	1515 Clay Street, Suite 1400 Oakland, CA 94612	(510) 622-2309 dnarala@waterboards.ca.gov
California Department of Toxic Substances Control (DTSC)	Robert Boggs, P.E.	700 Heinz Avenue, Suite 200 Berkeley, CA 94710-2737	(510) 540-3751 RBOGGS@dtsc.ca.gov
Presidio Trust Utilities Department	Robert Malaca Utilities Manager	Building 1750 Presidio Trust P.O. Box 29052 San Francisco, CA 94129-0052	(415) 561-3924 rmalaca@presidiotrust.gov
Presidio Trust and NPS Archeology Contacts	Sannie Osborn Historic Archeologist Leo Barker	Presidio Trust P.O. Box 29052 San Francisco, CA 94129-0052	(415) 561-5090 sosborn@presidiotrust.gov (415) 561-4832 leo_barker@nps.gov

Checked: MS Approved: RR

Table 2-1. Summary of Groundwater Monitoring and Well Abandonment Program
Corrective Action Implementation Work Plan Building 207/231 Area

Well Name	Water Bearing Zone	Location With Respect to Remedial Units	Perform Well Abandonment During Construction	PRE-CONSTRUCTION MONITORING PROGRAM [3] Frequency and Duration: One-time sampling event at least 2 months prior to start of construction Analytes: TPHd/fo (EPA Method 8015); VOCs (EPA Method 8260); As, Al, Mn, Fe (EPA Method 6010) Field Analysis: Water levels, pH, specific conductance, dissolved oxygen (DO)	POST-CONSTRUCTION MONITORING PROGRAM [1] [4] Frequency: Excavation Alternative (RUs 207, 38, 231, 230) YEAR 1: Quarterly AFTER YEAR 1: As, Al, Mn, Fe Annually and all other analytes and Field Analysis Semi-Annually Capping Alternative (RU 228) YEAR 1: Quarterly YEAR 2: As, Al, Mn, Fe Annually and all other analytes and Field Analysis Semi-Annually YEARS 3--10: Annually Duration: Monitor As, Al, Mn, Fe until Arsenic concentrations are below cleanup levels. Monitor all other analytes until COCs are below cleanup levels for 4 consecutive monitoring events. Monitoring will cease on a per individual analyte suite (e.g., VOCs) and /or by well basis Analytes: See RU-specific list of analytes below Field Analysis: Water levels, pH, specific conductance, Dissolved oxygen (well-specific)
BUILDING 207 AREA REMEDIAL UNIT					
207GW03	INTERMEDIATE	downgradient of RU 207	X		--
New Well 6	SHALLOW	east/crossgradient of RU 207	RETAIN		TPHg (EPA Method 8015) Benzene, MTBE (EPA Method 8021) PAHs (EPA Method 8270-SIM) Nickel (EPA Method 6010)
New Well 3	SHALLOW	downgradient of RU 207	RETAIN		TPHg (EPA Method 8015) Benzene, MTBE (EPA Method 8021) PAHs (EPA Method 8270-SIM) Nickel (EPA Method 6010)
New Well 4	SHALLOW	downgradient of RU 207	RETAIN		TPHg (EPA Method 8015) Benzene, MTBE (EPA Method 8021) PAHs (EPA Method 8270-SIM) Nickel (EPA Method 6010)
BUILDING 231 AREA REMEDIAL UNIT					
New Well 2	SHALLOW	downgradient of RU 231	RETAIN		TPHg (EPA Method 8015) TPHd,fo (EPA Method 8015 w/SGCU) VOCs [BTEX, MeCl, PCE, VC] (EPA Method 8260) PAHs (EPA Method 8270-SIM) Cr, Co, Cu, Pb, Hg, Ni, Ag, Zn (EPA Method 6010)
231GW06	INTERMEDIATE	downgradient of RU 231	X		
231GW09	SHALLOW	upgradient of RUs	RETAIN	X	TPHg (EPA Method 8015) TPHd,fo (EPA Method 8015 w/SGCU) VOCs [BTEX, MeCl, PCE, VC] (EPA Method 8260) PAHs (EPA Method 8270-SIM) Cr, Co, Cu, Pb, Hg, Ni, Ag, Zn, As (EPA Method 6010) Redox Parameters
231GW10	SHALLOW	upgradient of RU 208 sump	X	X	
231GW13	DEEP	west/cross-gradient of RU 207	X		
231GW15	INTERMEDIATE	west/cross-gradient of RU 207	X		
231GW16	SHALLOW	west/cross-gradient of RU 207	RETAIN	X	TPHg (EPA Method 8015) TPHd,fo (EPA Method 8015 w/SGCU) VOCs [BTEX, MeCl, PCE, VC] (EPA Method 8260) PAHs (EPA Method 8270-SIM) Cr, Co, Cu, Pb, Hg, Ni, Ag, Zn, As (EPA Method 6010) Redox Parameters
231GW17	DEEP	west/cross-gradient of RUs	X		
231GW18	INTERMEDIATE	west/cross-gradient of RUs	X		
231GW19	SHALLOW	west/cross-gradient of RUs	X		
231GW20	INTERMEDIATE	downgradient of RU 231	X	X	
231GW21	SHALLOW	downgradient of RU 231	X	X	
231GW22	SHALLOW	downgradient of RU 231	X	X	
231GW23	SHALLOW	upgradient of RUs 207/38	X		
231GW24	SHALLOW	west/cross-gradient of RUs	X		
231GW25	SHALLOW	downgradient of RU 231	RETAIN	X	TPHg (EPA Method 8015) TPHd,fo (EPA Method 8015 w/SGCU) VOCs [BTEX, MeCl, PCE, VC] (EPA Method 8260) PAHs (EPA Method 8270-SIM) Cr, Co, Cu, Pb, Hg, Ni, Ag, Zn, As (EPA Method 6010) Redox Parameters

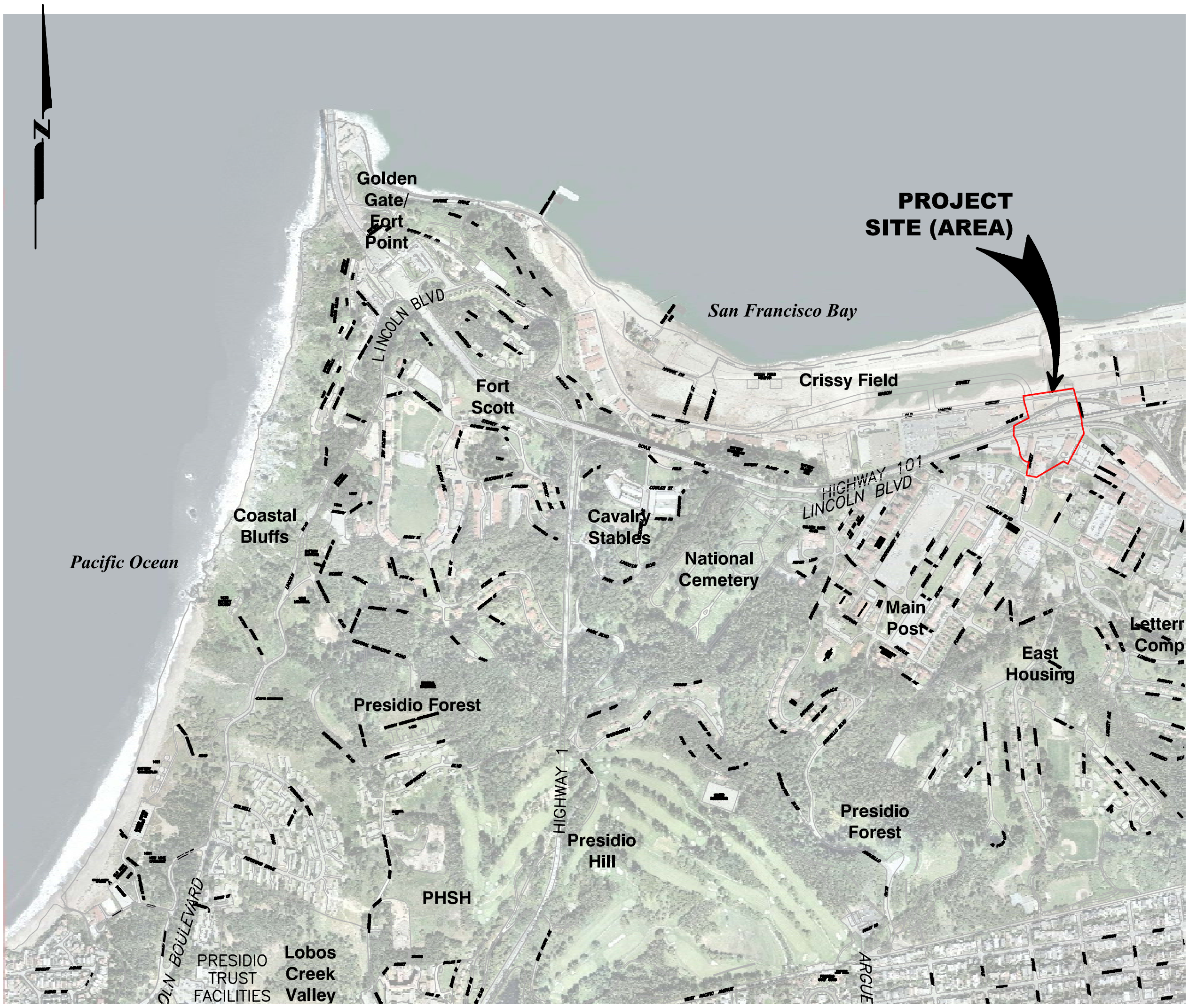
Table 2-1. Summary of Groundwater Monitoring and Well Abandonment Program
Corrective Action Implementation Work Plan Building 207/231 Area

Well Name	Water Bearing Zone	Location With Respect to Remedial Units	Perform Well Abandonment During Construction	PRE-CONSTRUCTION MONITORING PROGRAM [3] Frequency and Duration: One-time sampling event at least 2 months prior to start of construction Analytes: TPHd/fo (EPA Method 8015); VOCs (EPA Method 8260); As, Al, Mn, Fe (EPA Method 6010) Field Analysis: Water levels, pH, specific conductance, dissolved oxygen (DO)	POST-CONSTRUCTION MONITORING PROGRAM [1] [4] Frequency: Excavation Alternative (RUs 207, 38, 231, 230) YEAR 1: Quarterly AFTER YEAR 1: As, Al, Mn, Fe Annually and all other analytes and Field Analysis Semi-Annually Capping Alternative (RU 228) YEAR 1: Quarterly YEAR 2: As, Al, Mn, Fe Annually and all other analytes and Field Analysis Semi-Annually YEARS 3--10: Annually Duration: Monitor As, Al, Mn, Fe until Arsenic concentrations are below cleanup levels. Monitor all other analytes until COCs are below cleanup levels for 4 consecutive monitoring events. Monitoring will cease on a per individual analyte suite (e.g., VOCs) and /or by well basis Analytes: See RU-specific list of analytes below Field Analysis: Water levels, pH, specific conductance, Dissolved oxygen (well-specific)
231GW26	INTERMEDIATE	downgradient of RU 231	X	X	
231GW27	INTERMEDIATE	west/cross-gradient of RUs	X		
231GW28	INTERMEDIATE	east/upgradient of RU 231	X		
231GW29	INTERMEDIATE	west/cross-gradient to RU 230	X		
231GW30	SHALLOW	upgradient of RU 207	X		
231PZ01	SHALLOW	downgradient of RU 231	X	X	
231PZ02	SHALLOW	downgradient of RU 231	X		
231PZ03	SHALLOW	west/cross-gradient to RU 230	X		
231PZ04	SHALLOW	west/cross-gradient to RU 230	X	X	
OW-1	INTERMEDIATE	west/cross-gradient to RU 230	X		
HGB-2-20	--	west/cross-gradient to RU 38	X		
HGB-2-40	--	west/cross-gradient to RU 38	X		
HGB-2-71	--	west/cross-gradient to RU 38	X		
HGB-3-28	--	west/cross-gradient to RU 230	X		
HGB-3-64	--	west/cross-gradient to RU 230	X		
HGB-3-74	--	west/cross-gradient to RU 230	X		
231EW01	--	downgradient of RU 231	X		
231EW02	--	downgradient of RU 231	X		
231EW03	--	downgradient of RU 231	X		
231EW04	--	downgradient of RU 231	X		
231EW05	--	downgradient of RU 231	X		
231EW06	--	downgradient of RU 231	X		
231EW07	--	downgradient of RU 231	X		
231IW01	--	downgradient of RU 231	X		
231IW02	--	downgradient of RU 231	X		
231IW03	--	downgradient of RU 231	X		
231IW04	--	downgradient of RU 231	X		
231IW05	--	downgradient of RU 231	X		
231IW06	--	downgradient of RU 231	X		
231IW07	--	downgradient of RU 231	X		
231IW08	--	downgradient of RU 231	X		
231IW09	--	downgradient of RU 231	X		
231IW10	--	downgradient of RU 231	X		
231IW11	--	downgradient of RU 231	X		
BUILDING 228 AREA REMEDIAL UNIT					
New Well 1	SHALLOW	downgradient of RU 228	RETAIN		TPHd, TPHfo (EPA Method 8015) VOCs [1,2-DCB] (EPA Method 8260) Nickel (EPA Method 6010)
BUILDING 38 AREA REMEDIAL UNIT					
New Well 5	SHALLOW	downgradient of RU 38	RETAIN		TPHd,fo (EPA Method 8015 w/SGCU) PAHs (EPA Method 8270-SIM) Lead, Zinc (EPA Method 6010)
BUILDING 230 AREA REMEDIAL UNIT [2]					
231GW11	SHALLOW	downgradient of RU 230	RETAIN	X	Soil COCs for which groundwater will be monitored: TPHd,fo (EPA Method 8015 w/SGCU) PAHs (EPA Method 8270-SIM) Lead, Zinc, As (EPA Method 6010) Redox Parameters

FOOTNOTES:
START OF CONSTRUCTION WILL BE CONTINGENT UPON REGULATORY (Water Board) APPROVAL OF THE BUILDING 207/231 CAP AREA IMPLEMENTATION WORK PLAN.
-- = INDICATES DATA IS NOT APPLICABLE OR AVAILABLE.
[1] ALL POST-CONSTRUCTION MONITORING WELLS WILL BE ABANDONED AFTER MONITORING PROGRAM CRITERIA ARE MET UPON REGULATORY APPROVAL.
[2] NO GROUNDWATER SAMPLING WAS CONDUCTED AT BUILDING 230 RU, THEREFORE, COCs IN GROUNDWATER NOT IDENTFIED; ANALYZE FOR SOIL COCs.
[3] PRE-CONSTRUCTION MONITORING OBJECTIVES: ONE TIME MONITORING EVENT TO FURTHER ESTABLISH PRE-CONSTRUCTION BASELINE CONDITIONS FOR (1) PETROLEUM-RELATED COC CONCENTRATION TRENDS, AND (2) ARSENIC AND ASSOCIATED REDOX PARAMETERS.
[4] POST-CONSTRUCTION MONITORING OBJECTIVES: CONDUCT POST-CONSTRUCTION ASSESSMENT OF (1) REMEDY EFFECTIVENESS IN REDUCING COC CONCENTRATIONS BELOW CLEANUP LEVELS, AND (2) POTENTIAL FOR OBTAINING CLEAN CLOSURE OF RU / LISTING OF LAND USE CONTROL IF / WHEN CLEANUP LEVELS ARE MET IN GROUNDWATER AS FOLLOWS.
YEAR 1: MONITOR FOR (1) ARSENIC AND ASSOCIATED REDOX PARAMETERS, AND (2) RU-SPECIFIC COCs.
AFTER YEAR 1: MONITOR FOR (1) ARSENIC AND ASSOCIATED REDOX PARAMETERS ANNUALLY (2) RU-SPECIFIC COCs SEMI-ANNUALLY.
"REDOX PARAMETERS" ARE OTHER METALS ANALYZED UNDER EPA TEST METHOD 6010 WITH As (Al, Fe, Mn) AND FIELD MEASUREMENT OF DISSOLVED OXYGEN (DO) AND OXIDATION REDUCTION POTENTIAL (ORP).

Checked: MS Approved: RR

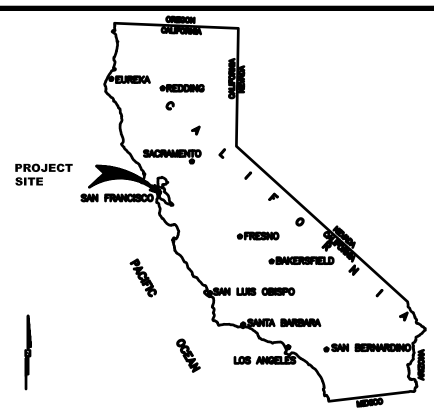
FIGURES



NOT TO SCALE

LEGEND

BUILDING 207/231 PROJECT AREA



LOCATION MAP
NOT TO SCALE

NOTES

1. SITE TOPOGRAPHY PROVIDED BY PRESIDIO TRUST AS PERFORMED BY KUCERA INTERNATIONAL INC, 38133 WESTERN PARKWAY, WILLOUGHBY, OH 44094, (440)975-4230. DATE OF TOPOGRAPHIC AERIAL SURVEY IS MARCH 24, 2000. DATE OF GPS GROUND CONTROL IS APRIL 20, 2000. THE COORDINATES ARE BASED ON NAD 27 CALIFORNIA STATE PLANE – ZONE 3 – U.S. SURVEY FEET. ELEVATIONS ARE BASED ON NAVD 88 – U.S. SURVEY FEET. UPDATED TOPOGRAPHIC MAPPING PROVIDED BY CHAUDHARY & ASSOC. USING THE SAME DATUMS, UNDER SUBCONTRACT TO MACTEC ON APRIL 7, 2005.

2. SEE CONTRACT SPECIFICATIONS FOR ADDITIONAL INFORMATION REGARDING SITE CONDITIONS AND REQUIREMENTS OF WORK.

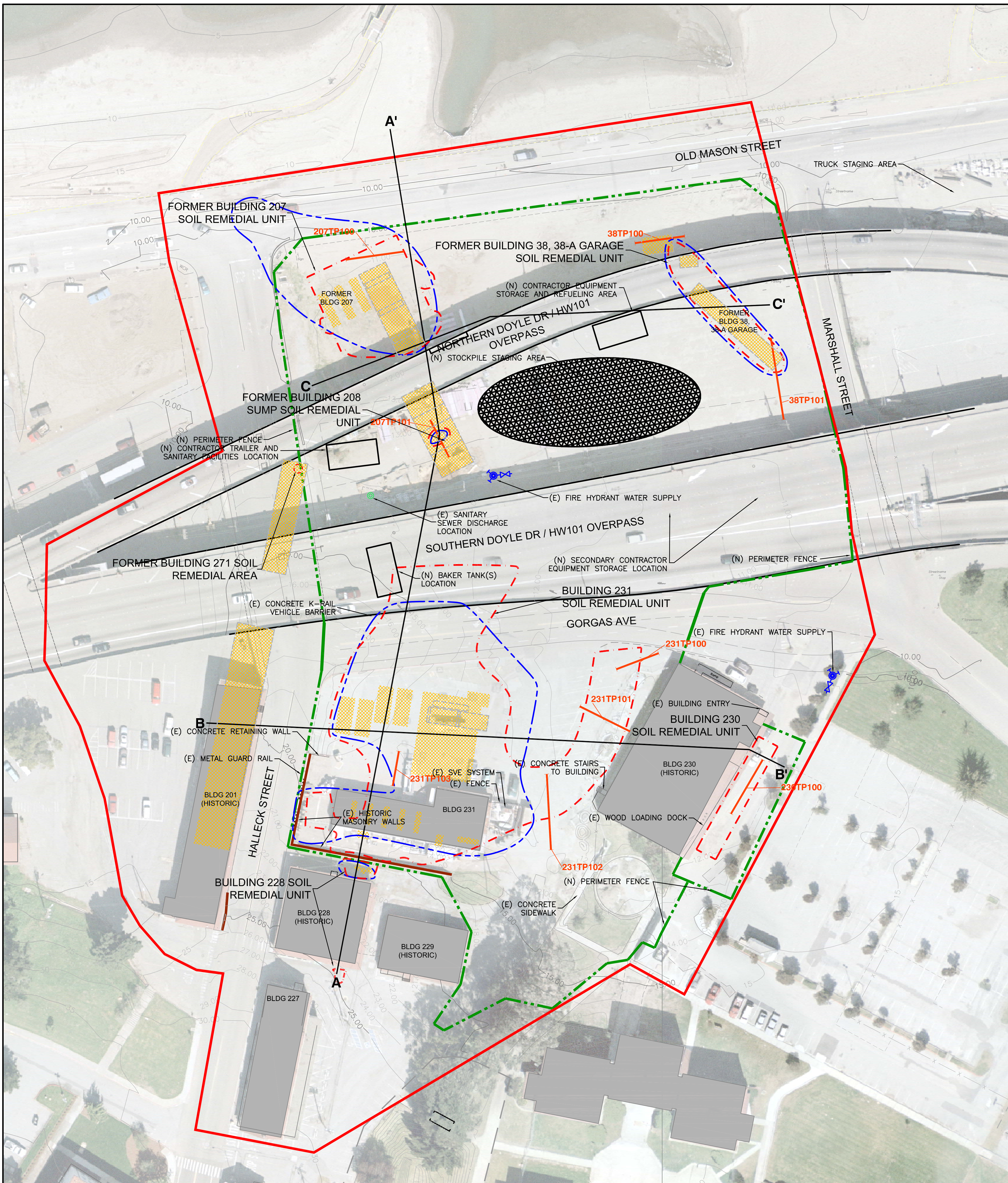
4084075106018.DWG 1.0
20070803.0943

MACTEC

SITE LOCATION MAP
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
1-1

DRAWN	FILE NAME	PROJECT NUMBER	CHECKED	DATE	APPROVED	DATE
JHD	4084075106_02	4084075106	JHD	11/2007	RR	11/2007



LEGEND

HISTORIC WALL		PERIMETER FENCE	
TOPOGRAPHIC CONTOUR		STOCKPILE STAGING AREA	
BUILDING 207/231 AREA		FORMER STRUCTURE OR FEATURE	
GROUNDWATER REMEDIAL UNITS		SANITARY SEWER MANHOLE (SEE CONSTRUCTION DRAWINGS C-101 AND 102 FOR ASSOCIATED UTILITY PIPEING)	
SOIL REMEDIAL UNITS		FIRE HYDRANT (SEE CONSTRUCTION DRAWINGS C-101 AND 102 FOR ASSOCIATED UTILITY PIPEING)	
GEOARCHAEOLOGICAL TRENCH LOCATION			
GEOLOGIC CROSS SECTION	B——B'		

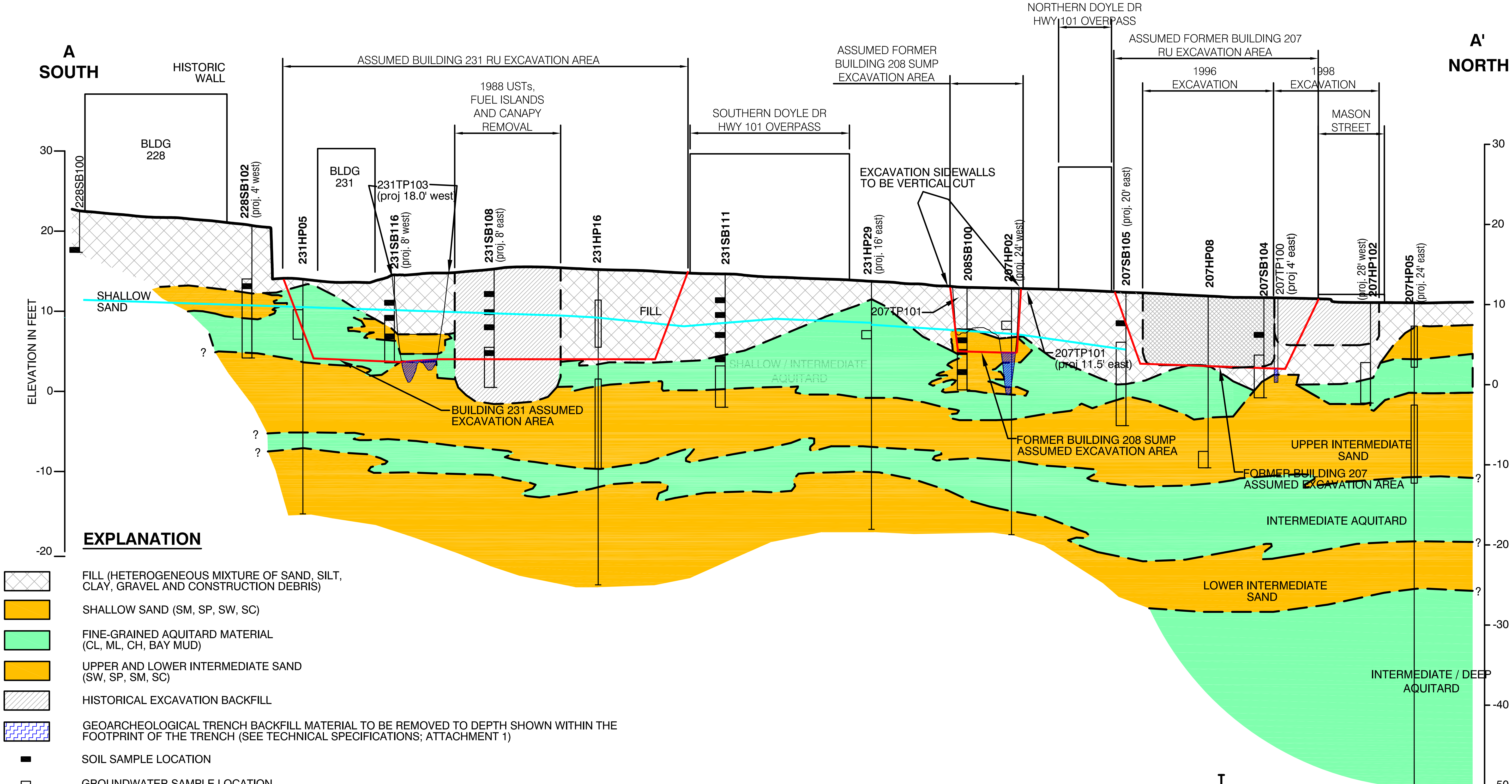
4084075106019.DWG 96.0
20071016.1042

MACTEC

SITE PLAN AND REMEDIAL UNITS
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE: 1-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



EXPLANATION

- FILL (HETEROGENEOUS MIXTURE OF SAND, SILT, CLAY, GRAVEL AND CONSTRUCTION DEBRIS)
- SHALLOW SAND (SM, SP, SW, SC)
- FINE-GRAINED AQUITARD MATERIAL (CL, ML, CH, BAY MUD)
- UPPER AND LOWER INTERMEDIATE SAND (SW, SP, SM, SC)
- HISTORICAL EXCAVATION BACKFILL
- GEOARCHEOLOGICAL TRENCH BACKFILL MATERIAL TO BE REMOVED TO DEPTH SHOWN WITHIN THE FOOTPRINT OF THE TRENCH (SEE TECHNICAL SPECIFICATIONS; ATTACHMENT 1)
- SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- WELL OR PIEZOMETER SCREEN INTERVAL
- NOVEMBER 28, 2005 SHALLOW SAND POTENTIOMETRIC SURFACE (TREADWELL AND ROLLO, OCTOBER 2006)
- PROFILE OF ASSUMED EXCAVATION AREA

NOTES:

1. CROSS-SECTION LOCATIONS ARE SHOWN ON FIGURE 1-2.
2. HORIZONTAL DATUM: NAD 27 CALIFORNIA STATE PLANE - ZONE 3
   VERTICAL DATUM: NAVD 88 - U.S. SURVEY FEET.
3. POTENTIOMETRIC SURFACE WAS GENERATED FROM DATA SHOWN IN THE SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006(TREADWELL AND ROLLO, OCTOBER 2006).

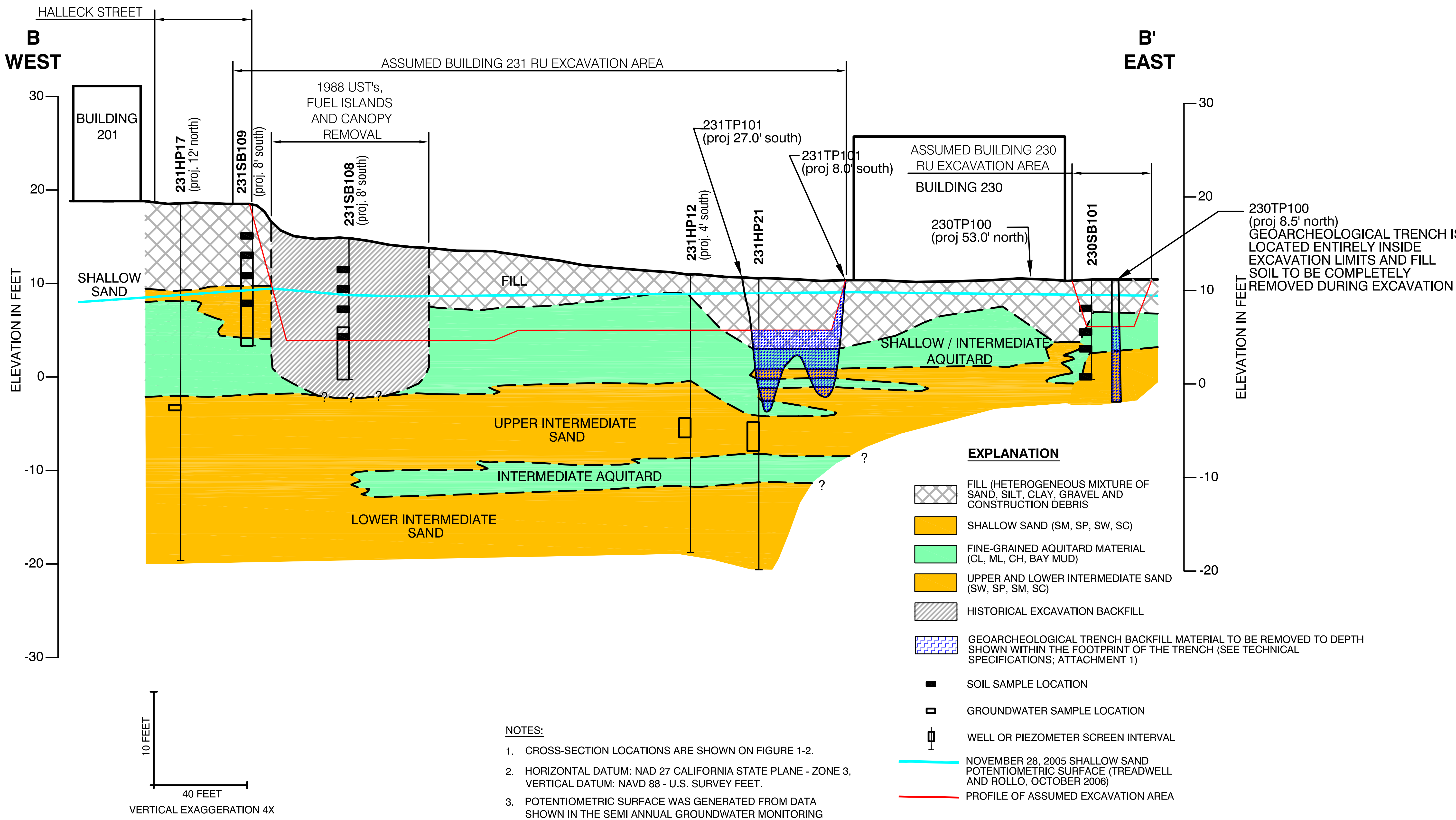
MACTEC

GEOLOGIC CROSS-SECTION A-A'
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE 1-3

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4089041001 107	JHD	11/2007	RR	11/2007

4084075106054.DWG 40.0
20071102.1114



NOTES:

1. CROSS-SECTION LOCATIONS ARE SHOWN ON FIGURE 1-2.
2. HORIZONTAL DATUM: NAD 27 CALIFORNIA STATE PLANE - ZONE 3, VERTICAL DATUM: NAVD 88 - U.S. SURVEY FEET.
3. POTENTIOMETRIC SURFACE WAS GENERATED FROM DATA SHOWN IN THE SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006(TREADWELL AND ROLLO, OCTOBER 2006).

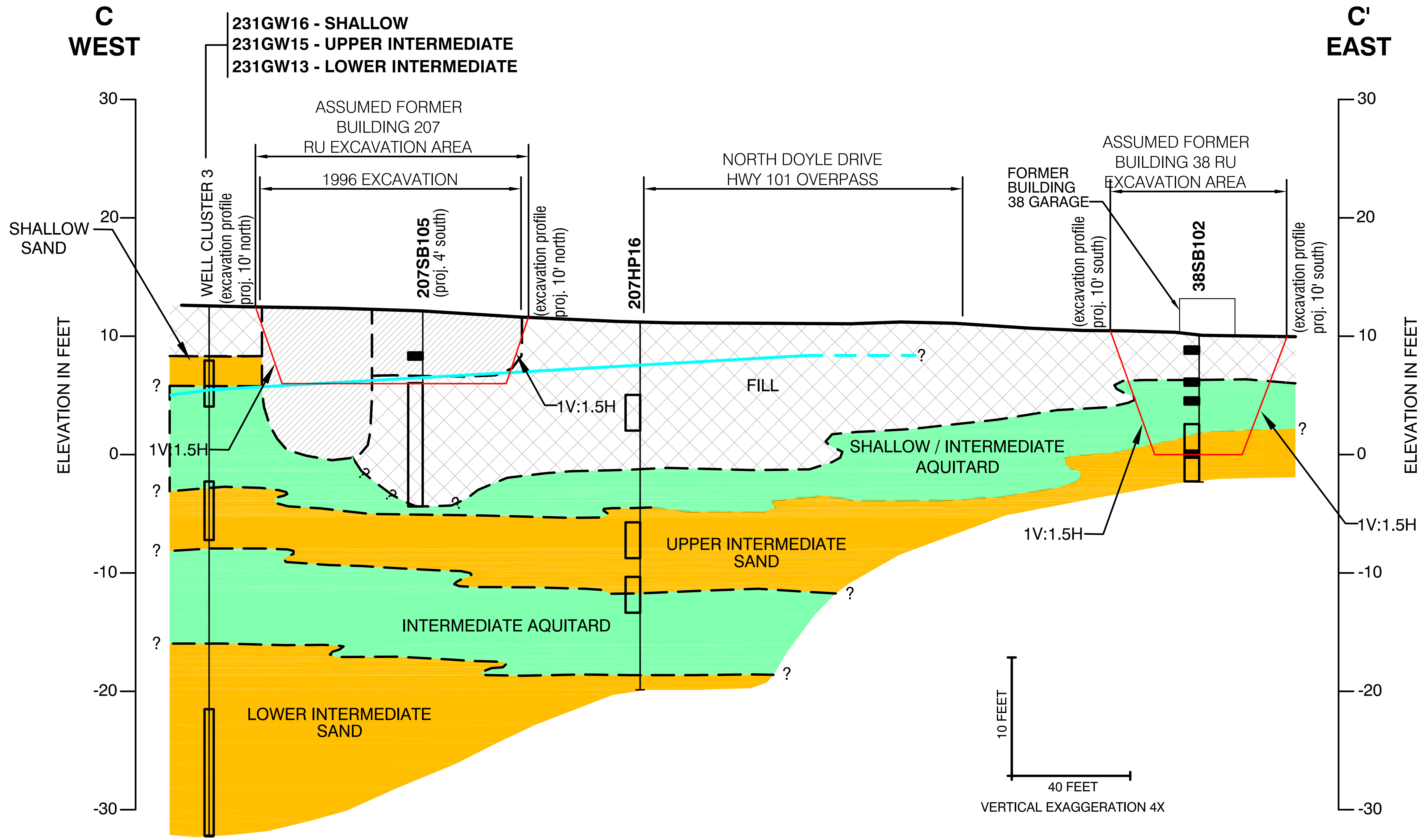
MACTEC

GEOLOGIC CROSS-SECTION B-B'
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
1-4

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

4084075106021.DWG 40.0
20070803.0947



NOTES:

1. CROSS-SECTION LOCATIONS ARE SHOWN ON FIGURE 1-2.
2. HORIZONTAL DATUM: NAD 27 CALIFORNIA STATE PLANE - ZONE 3
   VERTICAL DATUM: NAVD 88 - U.S. SURVEY FEET.
3. POTENTIOMETRIC SURFACE WAS GENERATED FROM DATA SHOWN IN THE SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006(TREADWELL AND ROLLO, OCTOBER 2006).

EXPLANATION

- FILL (HETEROGENEOUS MIXTURE OF SAND, SILT, CLAY, GRAVEL AND CONSTRUCTION DEBRIS
- SHALLOW SAND (SM, SP, SW, SC)
- FINE-GRAINED AQUITARD MATERIAL (CL, ML, CH, BAY MUD)
- UPPER AND LOWER INTERMEDIATE SAND (SW, SP, SM, SC)
- HISTORICAL EXCAVATION BACKFILL
- GEOARCHEOLOGICAL TRENCH BACKFILL MATERIAL TO BE REMOVED TO DEPTH SHOWN WITHIN THE FOOTPRINT OF THE TRENCH (SEE TECHNICAL SPECIFICATIONS; ATTACHMENT 1)
- SOIL SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- WELL OR PIEZOMETER SCREEN INTERVAL
- NOVEMBER 28, 2005 SHALLOW SAND POTENTIOMETRIC SURFACE (TREADWELL AND ROLLO, OCTOBER 2006)
- PROFILE OF ASSUMED EXCAVATION AREA

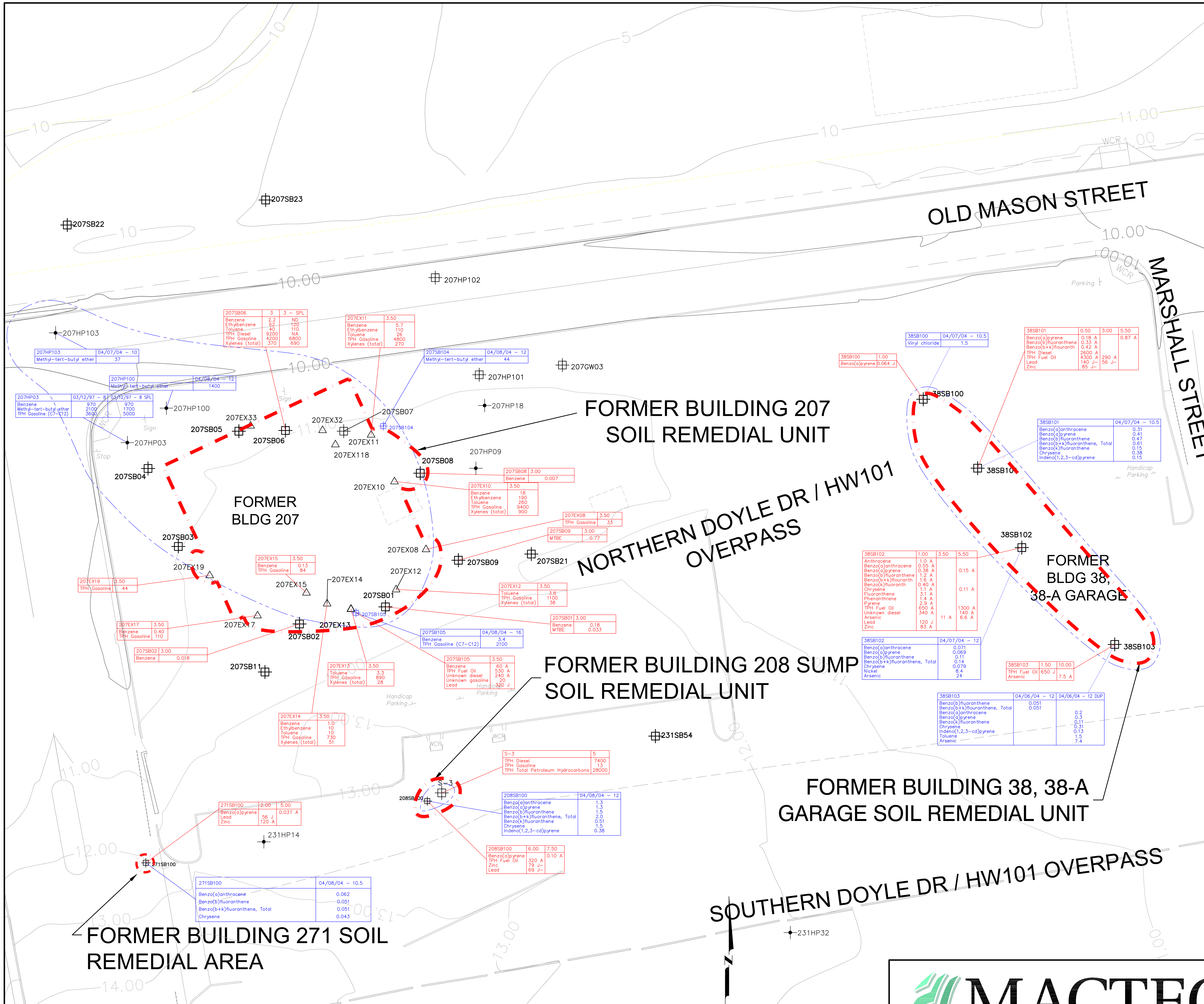
4084075106027.DWG 40.0
20070803.1023

MACTEC

GEOLOGIC CROSS-SECTION C-C'
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
1-5

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
GFA	4084075106	JHD	11/2007	RR	11/2007



Chemical	Final Soil Cleanup Levels (mg/kg)	Groundwater Cleanup Levels (µg/L)
Total Petroleum Hydrocarbons (TPH)		
TPH as gasoline	11.6	443
TPH as diesel	115	443
TPH as fuel oil	144	443
TPH Unknown Diesel Hydrocarbon	--	443
TPH Unknown Gasoline Hydrocarbon	--	443
Polynuclear Aromatic Compounds (PAHs)		
Acenaphthene	0.31	1200
Acenaphthylene	0.067	--
Anthracene	0.45	770
Benzo(a)anthracene	0.27	0.0044
Benzo(a)pyrene (B[a]P)	0.027	0.0044
Benzo(b)fluoranthene	0.27	0.0044
Benzo(b+k)flouranthene, Total	0.27	0.0044
Benzo(g,h,i)perylene	0.25	150
Benzo(k)fluoranthene	0.27	0.0044
Chrysene	0.67	0.0044
Dibenzo(a,h)anthracene	0.071	--
Fluoranthene	1.5	300
Fluorene	0.28	300
Indeno(1,2,3-cd)pyrene	0.26	0.0044
Naphthalene	0.3	300
Phenanthrene	0.61	230
Pyrene	0.79	230
Total PAHs	5.6	0.031
Metals / Inorganics		
Aluminum	76000	1,000
Arsenic	6.2	10
Barium	320	1,000
Beryllium	10	--
Cadmium	0.8	1.1
Calcium	--	--
Chloride	--	250,000
Chromium	140	50
Cobalt	21	3
Copper	49	3.1
Cyanide	1000	--
Iron	23000	--
Lead	50	2.5
Magnesium	--	--
Manganese	1800	--
Mercury	0.4	--
Nickel	110	8.2
Nitrate	--	10,000
Potassium	--	--
Silver	1	--
Sodium	--	--
Vanadium	90	15
Zinc	60	81
Volatile Organic Compounds (VOCs)		
1,1,1-Trichloroethane	--	200
1,1,2,2-Tetrachloroethane	--	1
1,1,2-Trichloroethane	--	5
1,1,-Dichloroethane	--	5
1,2,4-Trimethylbenzene	52	--
1,2-Dichlorobenzene	1.1	14
1,2-Dichloroethane	--	0.38
1,2-Dichloroethene (cis & trans)	--	6
1,2-Dichloropropane	--	5
1,3,5-Trimethylbenzene	21	--
1,3-Dichlorobenzene	--	65
1,4-Dichlorobenzene	0.13	5
2-Butanone	3.8	4,200
2-Hexanone	2.8	700
Acetone	0.24	1,500
Benzene	0.005	1
Bromoform	--	100
Carbon dioxide	--	--
Carbon disulfide	200	--
Chlorobenzene	--	70
Chloroform	--	80
Chloromethane	--	1.3
cis-1,2-Dichloroethene	0.19	6
Ethane	--	--
Ethene	--	--
Ethylbenzene	5	43
Methane	--	--
Methyl t-butyl ether	0.023	13
Methylene chloride	0.076	4.7
sec-Butylbenzene	--	--
Styrene	--	100
tert-Butylbenzene	--	--
Tetrachloroethene	0.087	0.8
Toluene	1	150
Trichloroethene	0.26	2.7
Trichlorofluoromethane	--	150
Vinyl chloride	--	0.5
Xylenes	5.7	130
Xylenes (m&p-)	5.7	130
Xylenes (o-)	5.7	130
Semi-Volatile Organic Compounds (SVOCs)		
Bis(2-ethylhexyl)phthalate	66	--
Pesticides and PCBs		
4,4-DDD	0.011	--
Arochlor 1016	0.033	0.00017
Polychlorinated Biphenyls (PCBs)		
PCB 1016	--	0.00017

HYDROPUNCH
SOIL BORING LOCATION
EXCAVATION SAMPLE LOCATION
SOIL BORING LOCATION WITH GRAB GROUNDWATER SAMPLE
GROUNDWATER REMEDIAL UNITS
SOIL REMEDIAL UNITS

GROUNDWATER CONCENTRATIONS EXCEEDING CLEANUP LEVELS:

38SB100	04/07/04 – 10.5
Vinyl chloride	1.5

STATION NAME
DATE AND DEPTH OF SAMPLE
CONCENTRATION µg/L
ANALYTE

SOIL CONCENTRATIONS EXCEEDING CLEANUP LEVELS:

38SB100	1.00
Benzo(a)pyrene	0.64 J

STATION NAME
DEPTH OF SAMPLE
CONCENTRATION mg/kg
ANALYTE

- SPL = Split - DUP = DUPLICATE

NOTE:
1. ONLY RESULTS THAT WERE DETECTED ABOVE CLEANUP LEVELS ARE SHOWN.
2. DETECTION LIMITS FOR VARIOUS PESTICIDES EXCEEDED CLEANUP LEVELS.
3. MOST CONSERVATIVE CLEANUP LEVELS ARE USED IN THE POSTING ON THIS FIGURE.

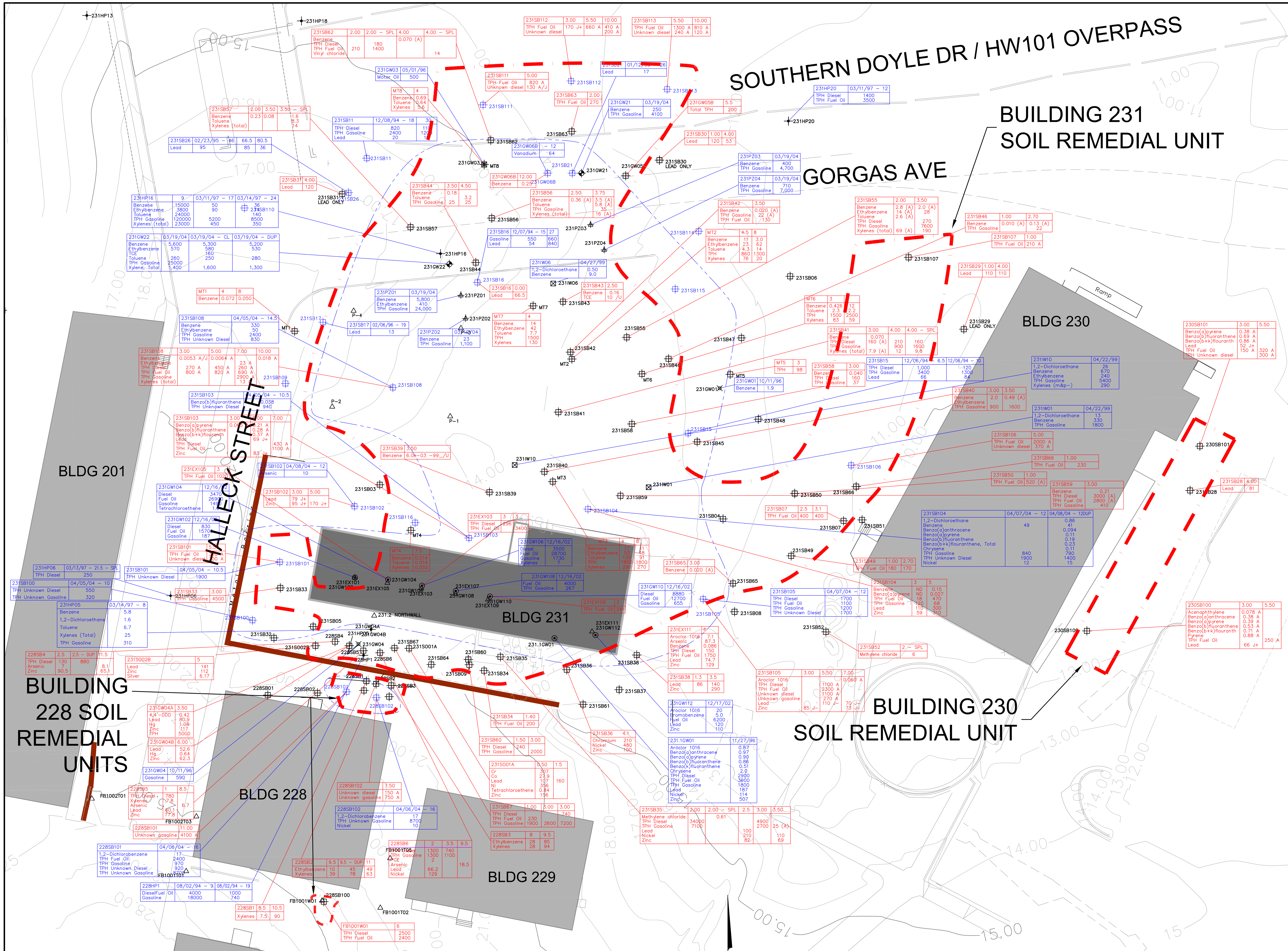
4084075106055.DWG 1.0
20071017.1904

MACTEC

SOIL AND GROUNDWATER CONCENTRATIONS
EXCEEDING CLEANUP LEVELS - BUILDING 207 AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
1-6

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106 02	JHD	11/2007	RR	11/2007



Chemical	Final Soil Cleanup Levels (mg/kg)	Groundwater Cleanup Levels (µg/L)
Total Petroleum Hydrocarbons (TPH)		
TPH as gasoline	11.6	443
TPH as diesel	115	443
TPH as fuel oil	144	443
TPH Unknown Diesel Hydrocarbon	--	443
TPH Unknown Gasoline Hydrocarbon	--	443
Polynuclear Aromatic Compounds (PAHs)		
Acenaphthene	0.31	1200
Acenaphthylene	0.067	--
Anthracene	0.45	770
Benzo(a)anthracene	0.27	0.0044
Benzo(a)pyrene (B[a]P)	0.027	0.0044
Benzo(b)fluoranthene	0.27	0.0044
Benzo(b+k)flouranthene, Total	0.27	0.0044
Benzo(g,h,i)perylene	0.25	150
Benzo(k)fluoranthene	0.27	0.0044
Chrysene	0.67	0.0044
Dibenzo(a,h)anthracene	0.071	--
Fluoranthene	1.5	300
Fluorene	0.28	300
Indeno(1,2,3-cd)pyrene	0.26	0.0044
Naphthalene	0.3	300
Phenanthrene	0.61	230
Pyrene	0.79	230
Total PAHs	5.6	0.031
Metals / Inorganics		
Aluminum	76000	1,000
Arsenic	6.2	10
Barium	320	1,000
Beryllium	10	--
Cadmium	0.8	1.1
Calcium	--	--
Chloride	--	250,000
Chromium	140	50
Cobalt	21	3
Copper	49	3.1
Cyanide	1000	--
Iron	23000	--
Lead	50	2.5
Magnesium	--	--
Manganese	1800	--
Mercury	0.4	--
Nickel	110	8.2
Nitrate	--	10,000
Potassium	--	--
Silver	1	--
Sodium	--	--
Vanadium	90	15
Zinc	60	81
Volatile Organic Compounds (VOCs)		
1,1,1-Trichloroethane	--	200
1,1,2,2-Tetrachloroethane	--	1
1,1,2-Trichloroethane	--	5
1,1,-Dichloroethane	--	5
1,2,4-Trimethylbenzene	52	--
1,2-Dichlorobenzene	1.1	14
1,2-Dichloroethane	--	0.38
1,2-Dichloroethene (cis & trans)	--	6
1,2-Dichloropropane	--	5
1,3,5-Trimethylbenzene	21	--
1,3-Dichlorobenzene	--	65
1,4-Dichlorobenzene	0.13	5
2-Butanone	3.8	4,200
2-Hexanone	2.8	700
Acetone	0.24	1,500
Benzene	0.005	1
Bromoform	--	100
Carbon dioxide	--	--
Carbon disulfide	200	--
Chlorobenzene	--	70
Chloroform	--	80
Chloromethane	--	1.3
cis-1,2-Dichloroethene	0.19	6
Ethane	--	--
Ethene	--	--
Ethylbenzene	5	43
Methane	--	--
Methyl t-butyl ether	0.023	13
Methylene chloride	0.076	4.7
sec-Butylbenzene	--	--
Styrene	--	100
tert-Butylbenzene	--	--
Tetrachloroethene	0.087	0.8
Toluene	1	150
Trichloroethene	0.26	2.7
Trichlorofluoromethane	--	150
Vinyl chloride	--	0.5
Xylenes	5.7	130
Xylenes (m&p-)	5.7	130
Xylenes (o-)	5.7	130
Semi-Volatile Organic Compounds (SVOCs)		
Bis(2-ethylhexyl)phthalate	66	--
Pesticides and PCBs		
4,4-DDD	0.011	--
Arochlor 1016	0.033	0.00017
Polychlorinated Biphenyls (PCBs)		
PCB 1016	--	0.00017

HYDROPUNCH
SOIL BORING LOCATION
EXCAVATION SAMPLE LOCATION
SOIL BORING LOCATION WITH GRAB GROUNDWATER SAMPLE
GROUND WATER WELL SAMPLE LOCATION
GROUNDWATER REMEDIAL UNITS
SOIL REMEDIAL UNITS

GROUNDWATER CONCENTRATIONS EXCEEDING CLEANUP LEVELS:

38SB100	04/07/04 -- 10.5
Vinyl chloride	1.5

STATION NAME
DATE AND DEPTH OF SAMPLE
CONCENTRATION µg/L
ANALYTE

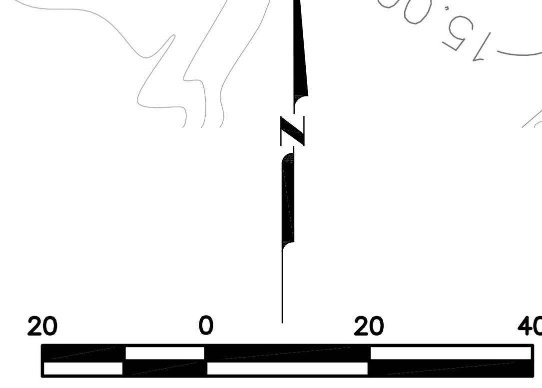
SOIL CONCENTRATIONS EXCEEDING CLEANUP LEVELS:

38SB100	1.00
Benzo(a)pyrene	0.64 J

STATION NAME
DEPTH OF SAMPLE
CONCENTRATION mg/kg
ANALYTE

- SPL = Split - DUP = DUPLICATE

NOTE:
1. ONLY RESULTS THAT WERE DETECTED ABOVE CLEANUP LEVELS ARE SHOWN.
2. DETECTION LIMITS FOR VARIOUS PESTICIDES EXCEEDED CLEANUP LEVELS.
3. MOST CONSERVATIVE CLEANUP LEVELS ARE USED IN THE POSTING ON THIS FIGURE.

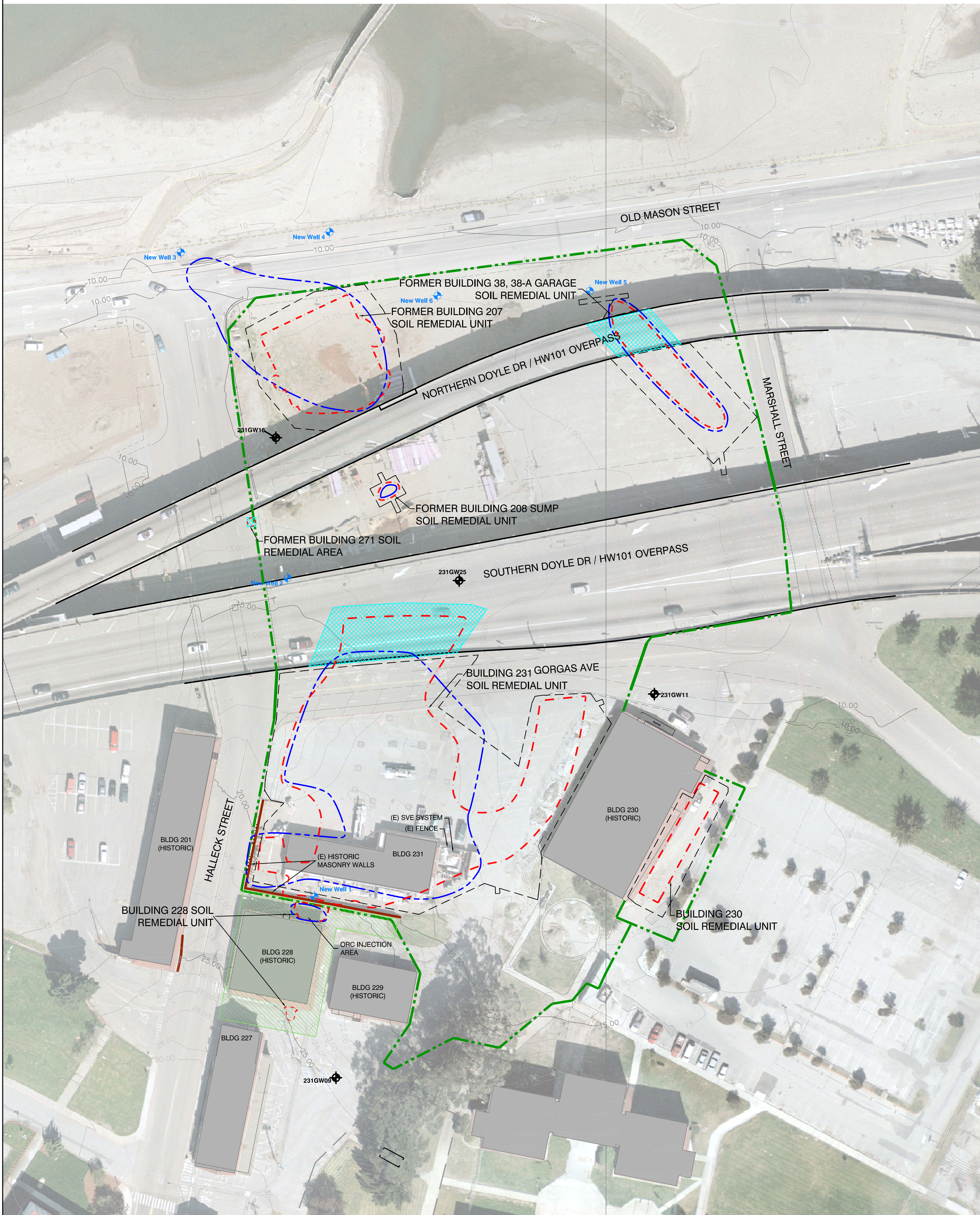


MACTEC

SOIL AND GROUNDWATER CONCENTRATIONS
EXCEEDING CLEANUP LEVELS - BUILDING 231 AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
1-7

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106 02	JHD	11/2007	RR	11/2007



LEGEND

HISTORIC WALL		TOPOGRAPHIC CONTOUR	24
PROPOSED MONITORING WELL	New Well 1	ASSUMED EXCAVATION AREA	
LAND USE CONTROL AREA (LUC)		GROUNDWATER REMEDIAL UNITS	
CAPPING/LAND USE CONTROL AREA (LUC)		SOIL REMEDIAL UNITS	
MONITORING WELL TO BE RETAINED	231GW25	PERIMETER FENCE	

N

40 0 40 80

SCALE IN FEET

4084075106030.DWG 1.0
200708031039

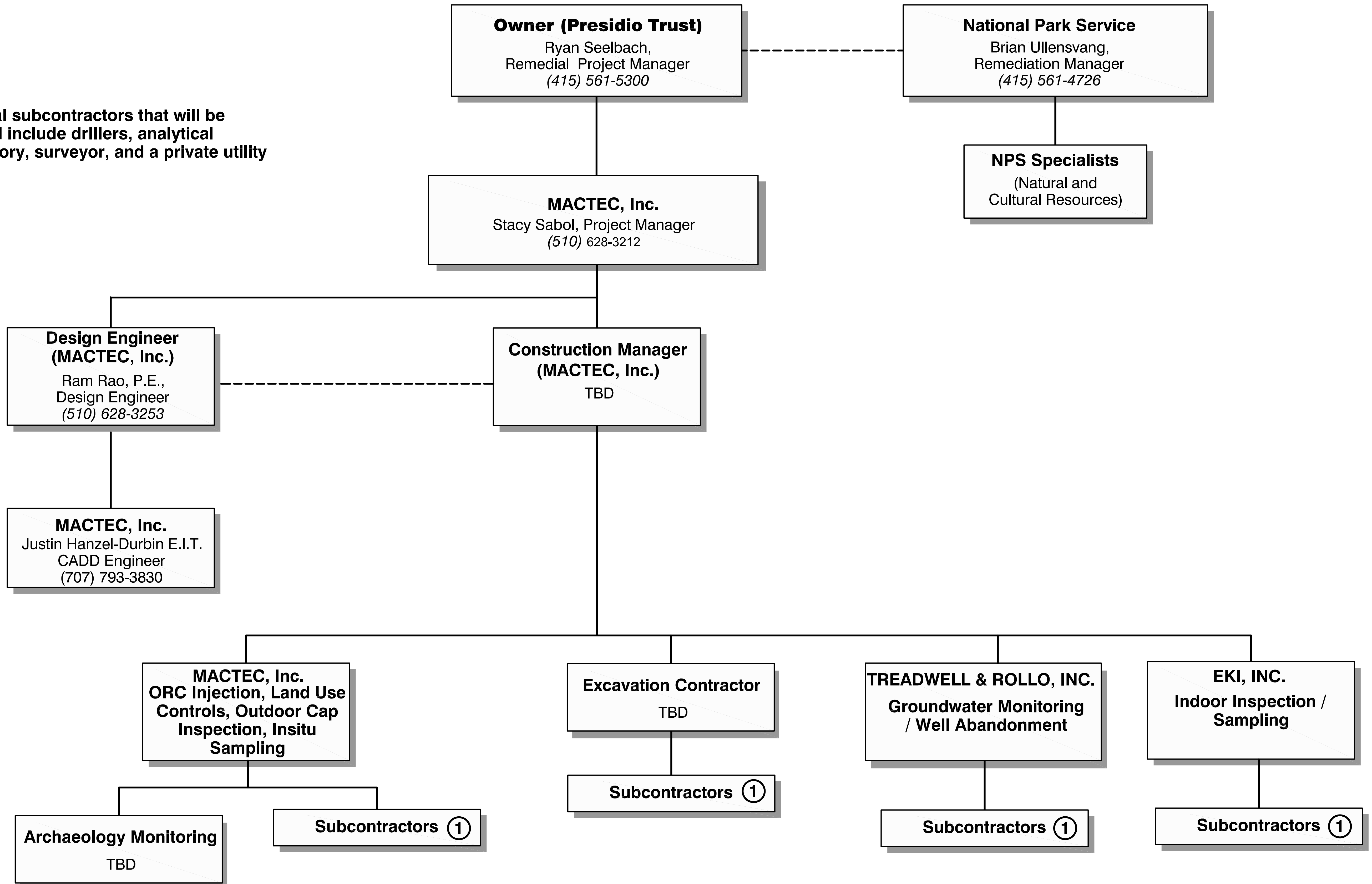
MACTEC

ASSUMED EXCAVATION AREAS, LAND USE CONTROL AREAS, AND GROUNDWATER MONITORING WELLS
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE:
1-8

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

NOTE:
1. Typical subcontractors that will be needed include drlllers, analytical laboratory, surveyor, and a private utility locator

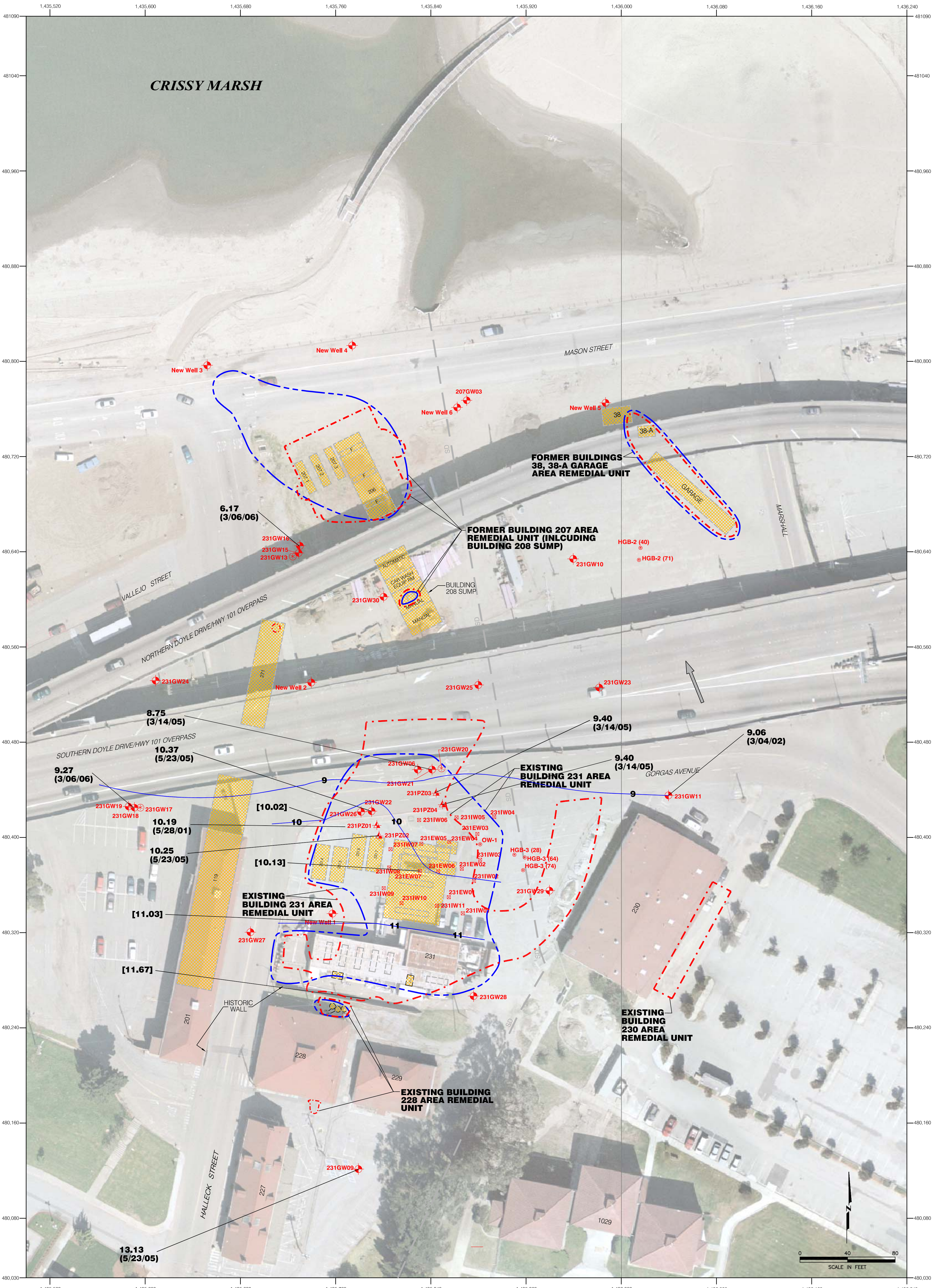


MACTEC

ORGANIZATION CHART OF CORRECTIVE ACTION CONTRACTING
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE **1-9**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



REFERENCES

1. HIGHEST REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

EXPLANATION

- SVE AND GROUNDWATER INJECTION (IW) OR EXTRACTION (EW) WELL
- GROUNDWATER REMEDIAL UNITS
- SOIL REMEDIAL UNITS
- MONITORING WELL - SHALLOW SAND
- MONITORING WELL - DEEP SAND
- PIEZOMETER - SHALLOW SAND
- 9 HIGH GROUNDWATER CONTOUR
- SD TENNESSEE HOLLOW UNDERGROUND PIPELINE
- APPROXIMATE DIRECTION OF SHALLOW ZONE GROUNDWATER FLOW (MAY 24, 2004)
- [11.67] INTERPOLATED SHALLOW ZONE GROUNDWATER ELEV. (PLLW) USED FOR CONTOUR GENERATION ONLY.
- 10.25 (5/23/05) HISTORICAL HIGH SHALLOW ZONE GROUNDWATER ELEV. (PLLW) & DATE MONITORED (1)
- FORMER STRUCTURE OR FEATURE

NOTE:
AERIAL PHOTOGRAPHY DATA MARCH 24, 2000 SOURCE: PRESIDIO TRUST GIS DEPARTMENT.

MACTEC

HISTORICAL HIGH WATER ELEVATIONS
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE 2-1

DRAWN	JOB NUMBER	CHECKED	DATE	APPROVED	DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

LEGEND

SOIL REMEDIAL UNITS	
TOPOGRAPHIC CONTOUR	24
PERIMETER FENCE	
ASSUMED EXCAVATION AREA	
GEOARCHAEOLOGICAL TRENCH LOCATION (FOR TRENCH LOGS, SEE TECHNICAL SPECIFICATIONS; ATTACHMENT 1)	
SOIL BORING LOCATION	
EXCAVATION SAMPLE LOCATION	
FORMER STRUCTURE OR FEATURE	

NOTES:

1. CONTRACTOR TO MAINTAIN A 1 FT SEPARATION OF TOP OF EXCAVATION FROM CALTRANS RIGHT OF WAY BOUNDARIES.

2. EXCAVATION LIMIT AND DEPTH SUBJECT TO CHANGE IF OVER-EXCAVATION IS REQUIRED.

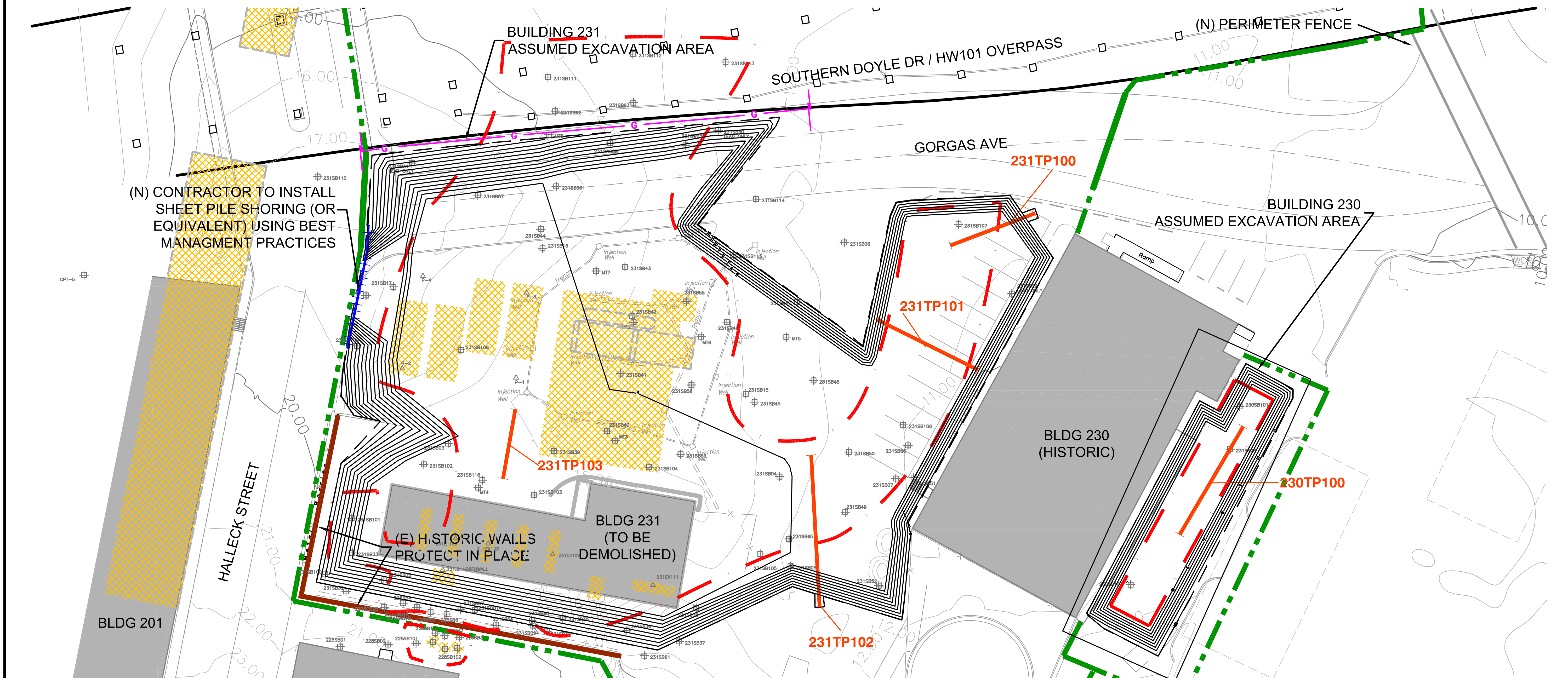
20.0
4084075106058.DWG
20071026.1734

MACTEC

PROPOSED EXCAVATION PLAN
NORTH AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
2-2A

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



LEGEND

SOIL REMEDIAL UNITS	
TOPOGRAPHIC CONTOUR	24
PERIMETER FENCE	
ASSUMED EXCAVATION AREA	
GEOARCHAEOLOGICAL TRENCH LOCATION (FOR TRENCH LOGS, SEE TECHNICAL SPECIFICATIONS; ATTACHMENT 1)	
EXCAVATION SHORING	
SOIL BORING LOCATION	
EXCAVATION SAMPLE LOCATION	
FORMER STRUCTURE OR FEATURE	
GAS LINE	G

NOTES:

1. CONTRACTOR TO MAINTAIN A 3 FT SEPARATION FROM THE GAS LINE RUNNING PARALLEL TO THE SOUTHERN DOYLE DRIVE OVERPASS.

2. EXCAVATION LIMIT AND DEPTH SUBJECT TO CHANGE IF OVER EXCAVATION IS REQUIRED.

4084075106058.DWG 1.0
20070803.0955

MACTEC

PROPOSED EXCAVATION PLAN
NORTH AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
2-2B

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4089041001	JHD	11/2007	RR	11/2007

LEGEND

			PIEZOMETER - SHALLOW SAND
			MONITORING WELL - SHALLOW SAND
			MONITORING WELL - INTERMEDIATE ZONES
			MONITORING WELL - DEEP ZONES
			SVE AND GROUNDWATER INJECTION (IW) OR EXTRACTION (EW) WELL

TO BE ABANDONED BY OVERDILLING AND BACK FILLING WITH BENTONITE AND FINISH SURFACE WITH CONCRETE

WITHIN LANDSCAPE RESTORATION AREA- TO BE ABANDONED BY OVERDILLING AND BACK FILLING WITH BENTONITE ONLY

OUTSIDE OF QUARTERMASTER REACH MARSH ZONE- TO BE ABANDONED BY OVERDRILLING AND BACK FILLING WITH NEAT CEMENT AND FINISH SURFACE WITH CONCRETE

N

20 0 20 40

SCALE IN FEET

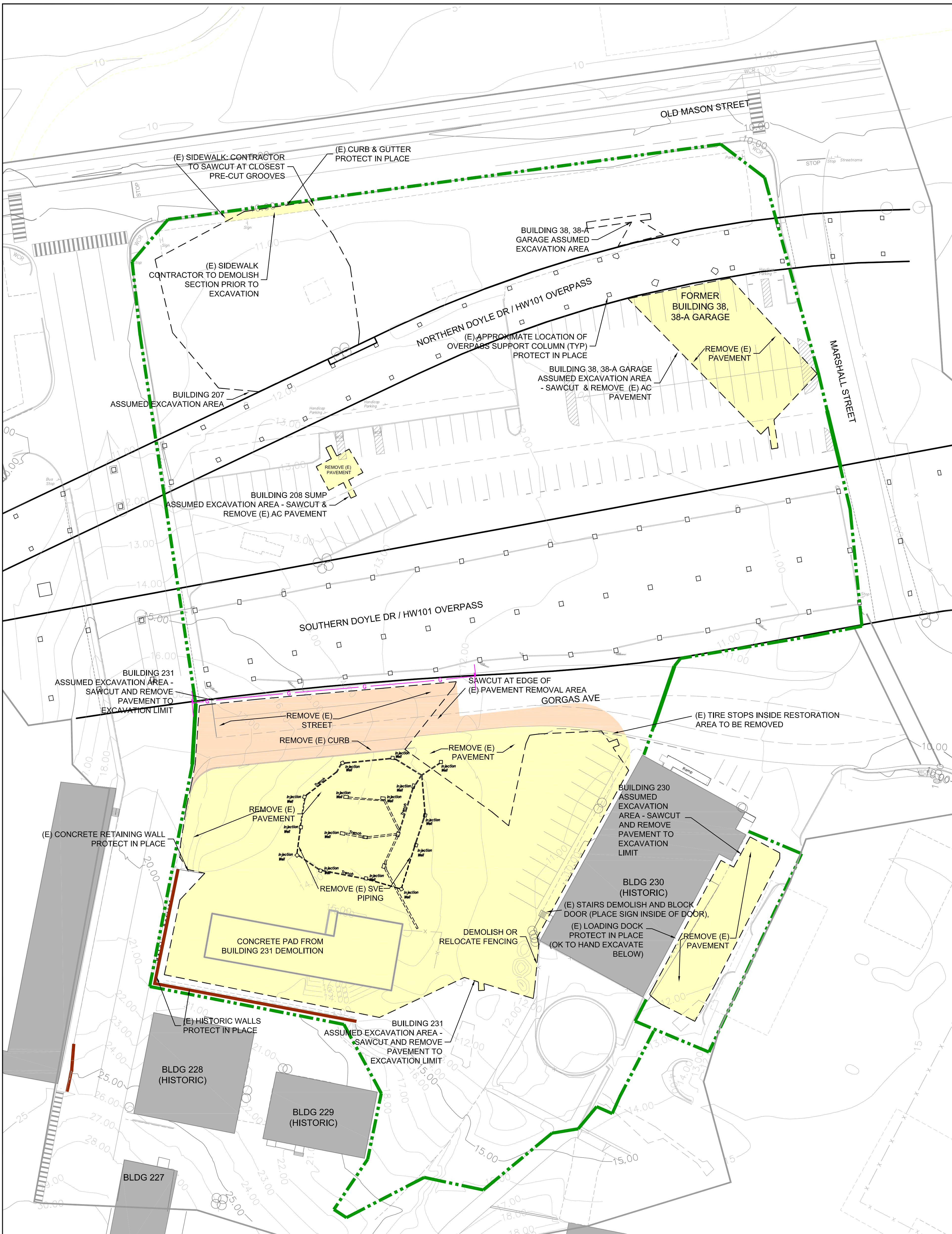
MACTEC

WELL ABANDONMENT PLAN
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE:
3-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

4084075106023.DWG 1.0
20070803.0953



LEGEND

TOPOGRAPHIC CONTOUR	24
PERIMETER FENCE	
ASSUMED EXCAVATION AREA	
HISTORIC WALL	
AC AND AB REMOVAL AREA (PARKING LOT)	
STREET REMOVAL AREA	

NOTES:

1. CONTRACTOR TO SAWCUT & REMOVE PAVEMENT (INCLUDING WHEEL STOPS) AS SHOWN BY GREEN SHADING.
2. CONTRACTOR TO RECYCLE ALL DEMOLISHED MATERIALS IF POSSIBLE. ASSUME NO MATERIALS TO BE SAVED UNLESS NOTED.
3. CONTRACTOR SHALL COORDINATE WITH TRUST'S UTILITY DEPT. FOR CONFORMATION OF UTILITY LOCATIONS A MINIMUM OF 2 WEEKS IN ADVANCE OF CONSTRUCTION.

N

30 0 30 60

SCALE IN FEET

4089041001.107.DWG 1.0
2007/07/2018

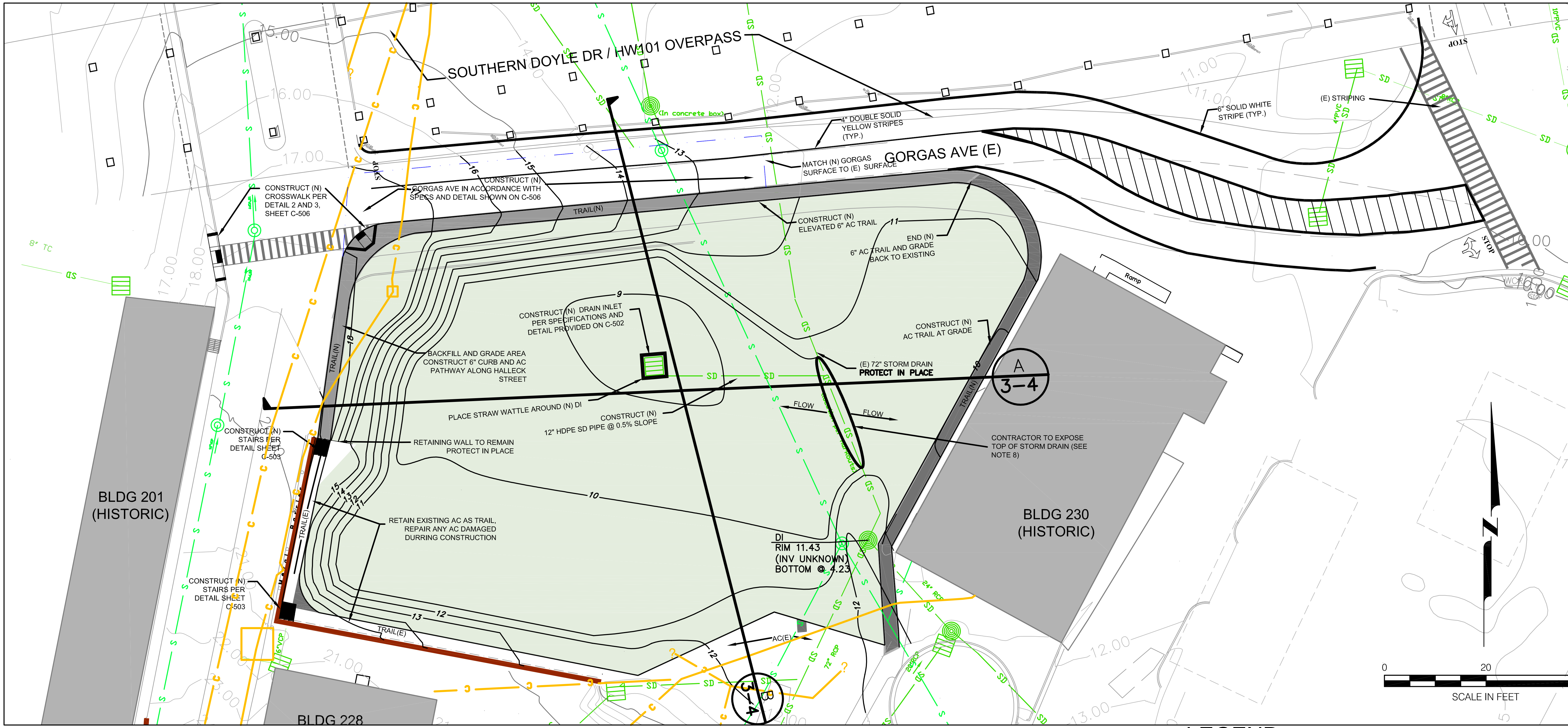
MACTEC

DEMOLITION PLAN
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE

3-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4089041001.107	JHD	11/2007	RR	11/2007



LEGEND

HISTORIC WALL

(N) TOPOGRAPHIC CONTOUR 24

(E) TOPOGRAPHIC CONTOUR 24

LIMITS OF GORGAS AVE RECONSTRUCTION

NEW AC PATH AT GRADE

NEW RAISED AC PATH

RE-VEGETATION AREA

CONSTRUCTION NOTES

1. SEE CONSTRUCTION DWG C-122 FOR PLAN AND PROFILE OF (N) GORGAS AVENUE AND (N) TRAIL.
2. SEE CONSTRUCTION DWG C-122 FOR (N) PVMT MARKINGS.
3. NEW GORGAS AVENUE SURFACE GRADE TO MATCH EXISTING GRADE AT THE JUNCTION WITH EXISTING STREET SURFACE.
4. CONSTRUCT (N) HANDICAPPED RAMPS PER CONSTRUCTION DRAWINGS DETAILS 2 AND 3 SHEET C-506.
5. ALL EXPOSED BACKFILL SURFACES SHALL BE REVEGITATED ACCORDING TO PRE APPROVED TRUST/NPS PLAN.
6. CONSTRUCT NEW AC TRAIL. (N) GORGAS AVENUE TRAIL SHALL SLOPE TO THE NORTH. (N) TRAIL ADJACENT TO BUILDING 230 SHALL SLOPE TOWARD DRAINAGE DITCH TO THE EAST.
7. (N) AC TRAIL SHALL CONFORM TO (E) AC WHERE (N) AC TRAIL MEETS (E) AS SHOWN. PROTECT (E) AC IN PLACE AS (E) AC SHALL SERVE AS TRAIL.
8. IN THE VICINITY OF THE 72" STORM DRAIN THE FINAL SURFACE ELEVATION WILL BE RESTORED TO 10 FEET (NAVD 88). A PORTION OF THE 72" STORM DRAIN WILL BE EXPOSED PROVIDED ITS TOP IS ABOVE THE RESTORED ELEVATION.

MACTEC

GRADING PLAN
FOR BUILDING 231 AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
3-3

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106 02	JHD	11/2007	RR	11/2007

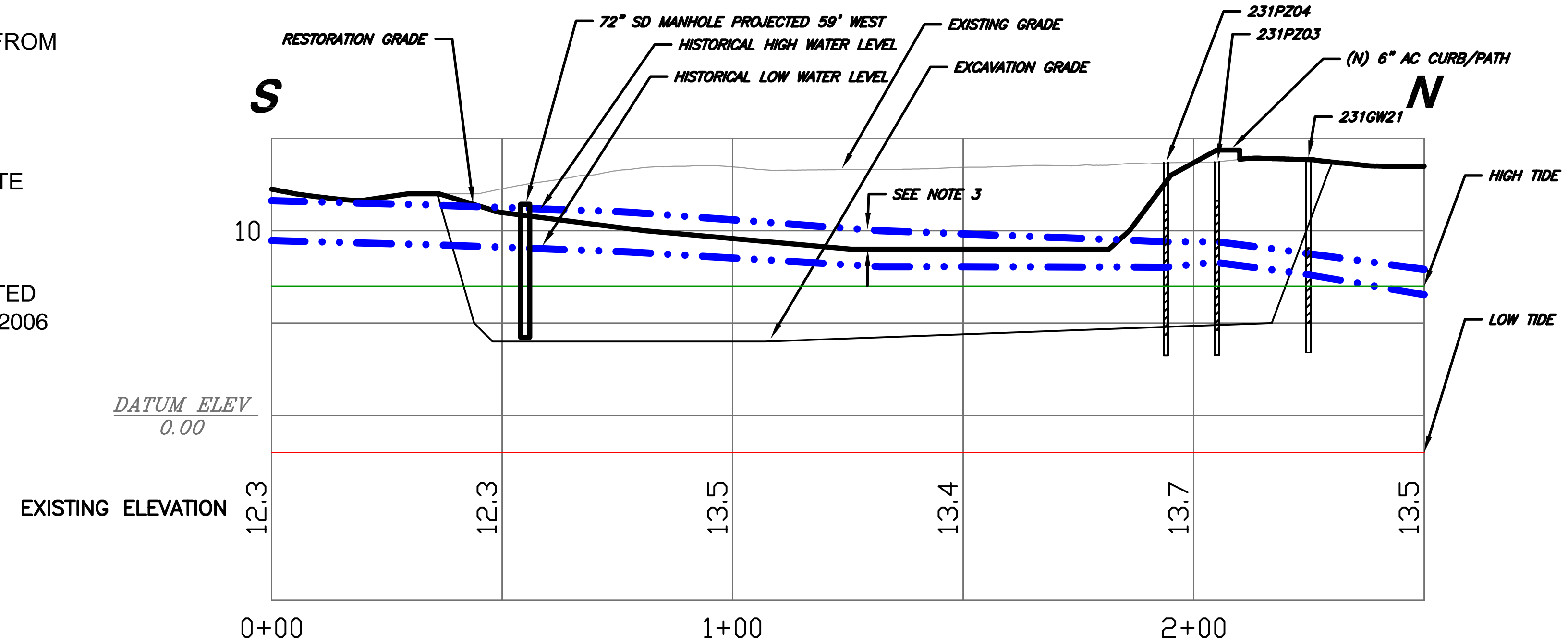
4084075106059.DWG 40.0
20071018.1711

NOTES:

1. HIGH AND LOW TIDE ELEVATION LINES WERE DERIVED FROM PEAK ELEVATIONS FROM 2006-2007 FOUND: "WATER SURFACE ELEVATION TIME SERIES, CRISSY FIELD WETLAND, 2006-2007". SOURCE; GGNRA TIDE GAGE (LOCATED UNDER MARSH FOOT BRIDGE) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION WEB SITE STATION #9414290.

2. HISTORICAL HIGH WATER LEVEL CONTOURS WERE DEVELOPED USING THE HIGHEST AND LOWEST REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

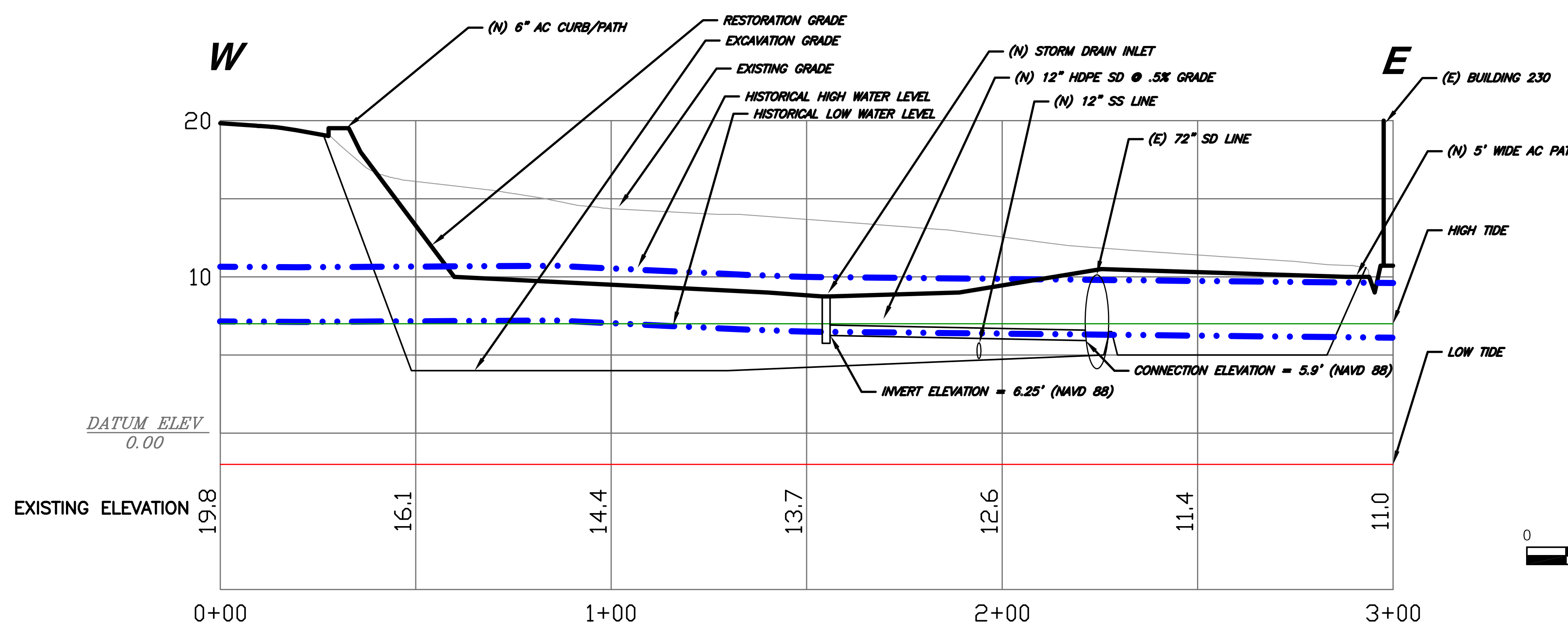
3. THE DIFFERENCE BETWEEN HIGH WATER LEVEL AND RESTORATION GRADE DOES NOT EXCEED 1 FT.



NORTH – SOUTH CROSS SECTION (B / 3–4)

SCALE: HORIZ : 1" = 40'
VERT : 1" = 10'

0 40 80
SCALE IN FEET



EAST – WEST CROSS SECTION (A / 3–4)

SCALE: HORIZ : 1" = 40'
VERT : 1" = 10'

0 40 80
SCALE IN FEET

LEGEND

- LOW TIDE ①
- HIGH TIDE ①
- EXISTING GRADE
- RESTORATION GRADE
- EXCAVATION GRADE
- HISTORIC HIGH/LOW GROUNDWATER LEVELS ②

MACTEC

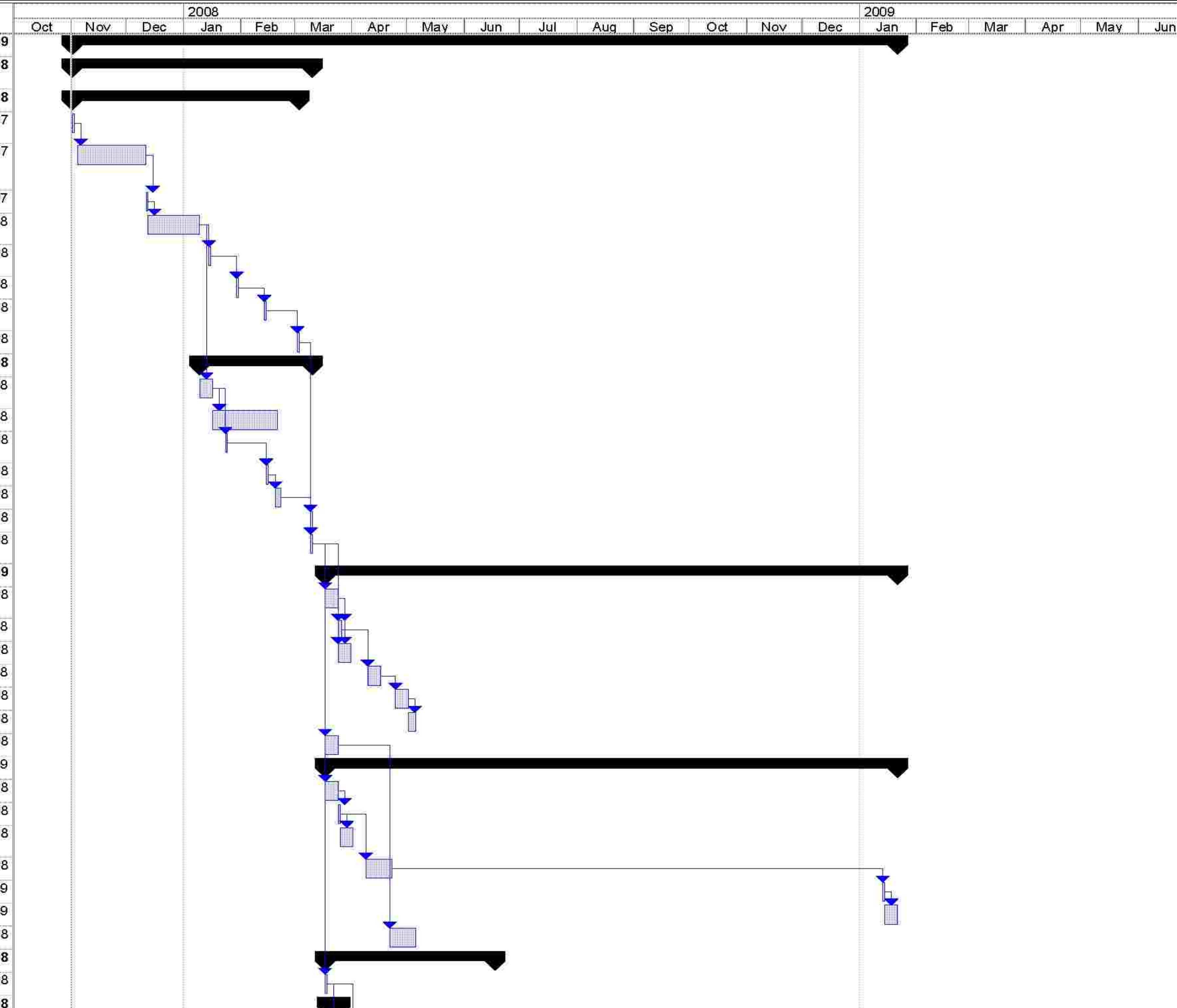
CROSS SECTIONS
BUILDING 231 RESTORATION AREA
PRESIDIO BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
3-4

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106 02	JHD	11/2007	RR	11/2007

4084075106059.DWG 40.0
20071018.1711

ID		Task Name	Start	Finish
1		**207/231 Corrective Action Implementation**	**Fri 11/2/07**	**Wed 1/21/09**
2		**Finalize Design for Corrective Action Implementation**	**Fri 11/2/07**	**Mon 3/10/08**
3		**Corrective Action Implementation Work Plan**	**Fri 11/2/07**	**Mon 3/3/08**
4		Submit the Revised Draft Corrective Action Implementation Work Plan for Review by NPS, Trust,	Fri 11/2/07	Fri 11/2/07
5		Stakeholder Review of Revised Draft Corrective Action Implementation Work Plan, Get Comments, Propose Responses	Mon 11/5/07	Tue 12/11/07
6		Stakeholder Meeting	Wed 12/12/07	Wed 12/12/07
7		Revise Based on Stakeholder Input and Submit for Review by NPS, Trust, Water Board, Stakeholders	Thu 12/13/07	Wed 1/9/08
8		Submittal of Draft Final Work Plan to NPS, Trust, Water Board, and Stakeholders	Tue 1/15/08	Tue 1/15/08
9		Agency Comments to Work Plan	Wed 1/30/08	Wed 1/30/08
10		Final Work Plan Submittal to NPS, Water Board, and Stakeholders	Thu 2/14/08	Thu 2/14/08
11		Agency Approval of Final Work Plan	Mon 3/3/08	Mon 3/3/08
12		**Trust Procurement**	**Thu 1/10/08**	**Mon 3/10/08**
13		Submit Construction Documents to Excavation Contractors to Procure Bid	Thu 1/10/08	Wed 1/16/08
14		N Squared and Project Review	Thu 1/17/08	Wed 2/20/08
15		Pre Bid Meeting to Answer Questions of Contractors	Thu 1/24/08	Thu 1/24/08
16		Bid Receipt from Excavation Contractors	Fri 2/15/08	Fri 2/15/08
17		Bid Review for Excavation Contractors	Wed 2/20/08	Fri 2/22/08
18		Trust Financial Approvals to Excavation Contractor	Mon 3/10/08	Mon 3/10/08
19		Trust to Provide Contract to Other Site Contractors (MACTEC, EKI, and T&R)	Mon 3/10/08	Mon 3/10/08
20		**RU 228 Corrective Action**	**Tue 3/18/08**	**Wed 1/21/09**
21		New Well 1 Installation and ORC Inj. Installation Mark-Out Notification	Tue 3/18/08	Mon 3/24/08
22		New Well 1 Installation, Locate, and Sampling	Tue 3/25/08	Wed 3/26/08
23		GW Monitoring Well Abandonment	Tue 3/25/08	Mon 3/31/08
24		Groundwater Monitoring Well Sample	Thu 4/10/08	Wed 4/16/08
25		ORC Injection	Fri 4/25/08	Thu 5/1/08
26		Locate (Survey) ORC Injection Points	Fri 5/2/08	Mon 5/5/08
27		MACTEC - Exterior Cap Inspection and Documentation	Tue 3/18/08	Mon 3/24/08
28		**Indoor Work**	Tue 3/18/08	Wed 1/21/09
29		Interior Cap Inspection and Documentation	Tue 3/18/08	Mon 3/24/08
30		Utility Clearance for Sub-Slab Slant Borings	Tue 3/25/08	Tue 3/25/08
31		Install Sub-Slab Slant Borings/ Soil Gas Sampling	Wed 3/26/08	Tue 4/1/08
32		Indoor Air Monitoring, Round 1	Wed 4/9/08	Tue 4/22/08
33		Indoor Air Monitoring, Round 2	Wed 1/14/09	Wed 1/14/09
34		Interior Cap Improvements	Thu 1/15/09	Wed 1/21/09
35		Exterior Cap Improvements	Tue 4/22/08	Mon 5/5/08
36		**Pre-Excavation**	**Tue 3/18/08**	**Tue 6/17/08**
37		Notice to Proceed	Tue 3/18/08	Tue 3/18/08
38		**Notification/Permits:**	**Wed 3/19/08**	**Tue 3/25/08**



Project: 207-231 Schedule.mpp
Date: Thu 11/1/07

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

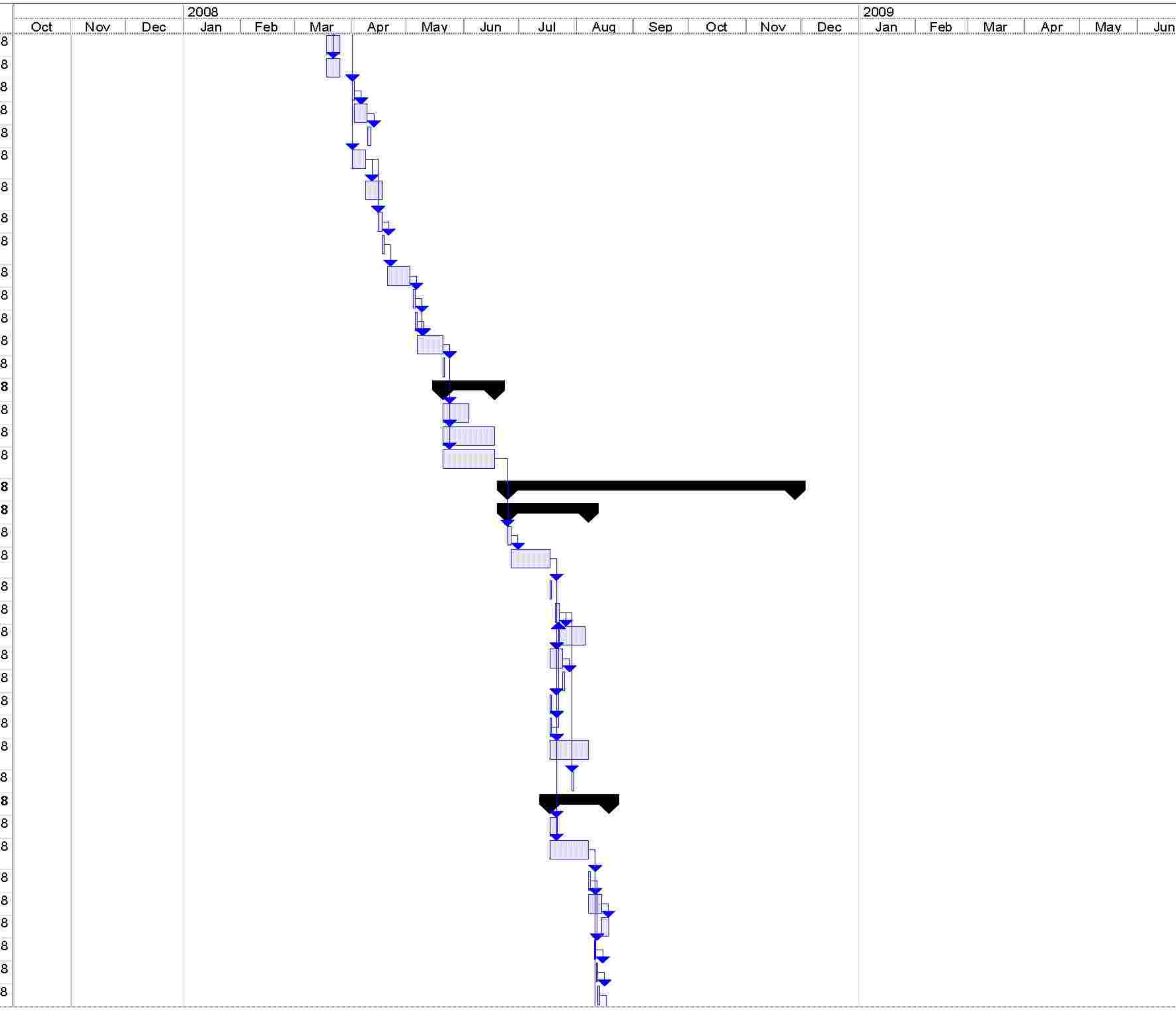
MACTEC

Corrective Action Implementation Schedule
Presidio Building 207/231 Area
Presidio of San Francisco
San Francisco, California

FIGURE 1 of 4
6-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
ACM	4084075106 02	JHD	11/07	RR	11/07

ID		Task Name	Start	Finish
39		BAAQMD Notification	Wed 3/19/08	Tue 3/25/08
40		Presidio Trust Excavation Permit	Wed 3/19/08	Tue 3/25/08
41		Mark Out For USA-Site Wide	Wed 4/2/08	Wed 4/2/08
42		Trust Utility Mark-Out/Review-Site Wide	Thu 4/3/08	Wed 4/9/08
43		USA Notification	Thu 4/10/08	Fri 4/11/08
44		Contractor Pre-Construction Submittal Submission - Plans/Equipment/Product/Qualifications	Wed 4/2/08	Tue 4/8/08
45		Contractor Pre-Construction Submittal Review - Plans/Equipment/Product/Qualifications	Wed 4/9/08	Thu 4/17/08
46		Contractor Pre-Construction Site Survey Staking	Wed 4/16/08	Thu 4/17/08
47		Contractor Pre-Construction Site Survey Staking Review Meeting	Fri 4/18/08	Fri 4/18/08
48		Pre-Construction Contractor Site Survey	Mon 4/21/08	Fri 5/2/08
49		Pre-Construction Meeting	Mon 5/5/08	Mon 5/5/08
50		Pre-Construction Safety Meeting	Tue 5/6/08	Tue 5/6/08
51		Mobilization	Wed 5/7/08	Tue 5/20/08
52		Project Kick Off Meeting	Wed 5/21/08	Wed 5/21/08
53		**Temporary Controls Installation**	**Wed 5/21/08**	**Tue 6/17/08**
54		Temporary Controls Installation	Wed 5/21/08	Tue 6/3/08
55		Utility Decomissioning and Rerouting Work	Wed 5/21/08	Tue 6/17/08
56		Installation of New Water Line for Building 230 (Potable Service), Includes Disinfection	Wed 5/21/08	Tue 6/17/08
57		**Excavation**	**Wed 6/25/08**	**Thu 11/27/08**
58		**RU 230 Corrective Action**	**Wed 6/25/08**	**Thu 8/7/08**
59		Pavement Removal	Wed 6/25/08	Thu 6/26/08
60		Excavation, Archaeological Montioring, Confirmation Sampling, Analysis and Review	Fri 6/27/08	Thu 7/17/08
61		Excavation Record Survey	Fri 7/18/08	Fri 7/18/08
62		Hydro Punch Installation and Sampling	Mon 7/21/08	Tue 7/22/08
63		Hydropunch Sample Analysis	Wed 7/23/08	Tue 8/5/08
64		Waste Profile and Analysis	Fri 7/18/08	Thu 7/24/08
65		Transportation and Disposal	Fri 7/25/08	Fri 7/25/08
66		Backfill, Compaction and Grading	Fri 7/18/08	Fri 7/18/08
67		AC Placement	Fri 7/18/08	Fri 7/18/08
68		Reinstall Water Line from Gorgas on East Side of Building 231	Fri 7/18/08	Thu 8/7/08
69		Final Record Survey	Wed 7/30/08	Wed 7/30/08
70		**RU 38 Corrective Action**	**Fri 7/18/08**	**Mon 8/18/08**
71		Pavement and Landscape Removal	Fri 7/18/08	Mon 7/21/08
72		Excavation, Archaeological Montioring, Confirmation Sampling, Analysis and Review	Fri 7/18/08	Thu 8/7/08
73		Excavation Record Survey	Fri 8/8/08	Fri 8/8/08
74		Waste Profile and Analysis	Fri 8/8/08	Thu 8/14/08
75		Transportation and Disposal	Fri 8/15/08	Mon 8/18/08
76		Backfill, Compaction and Grading	Mon 8/11/08	Mon 8/11/08
77		Paving	Tue 8/12/08	Tue 8/12/08
78		Final Record Survey	Wed 8/13/08	Wed 8/13/08



Project: 207-231 Schedule.mpp
Date: Thu 11/1/07

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

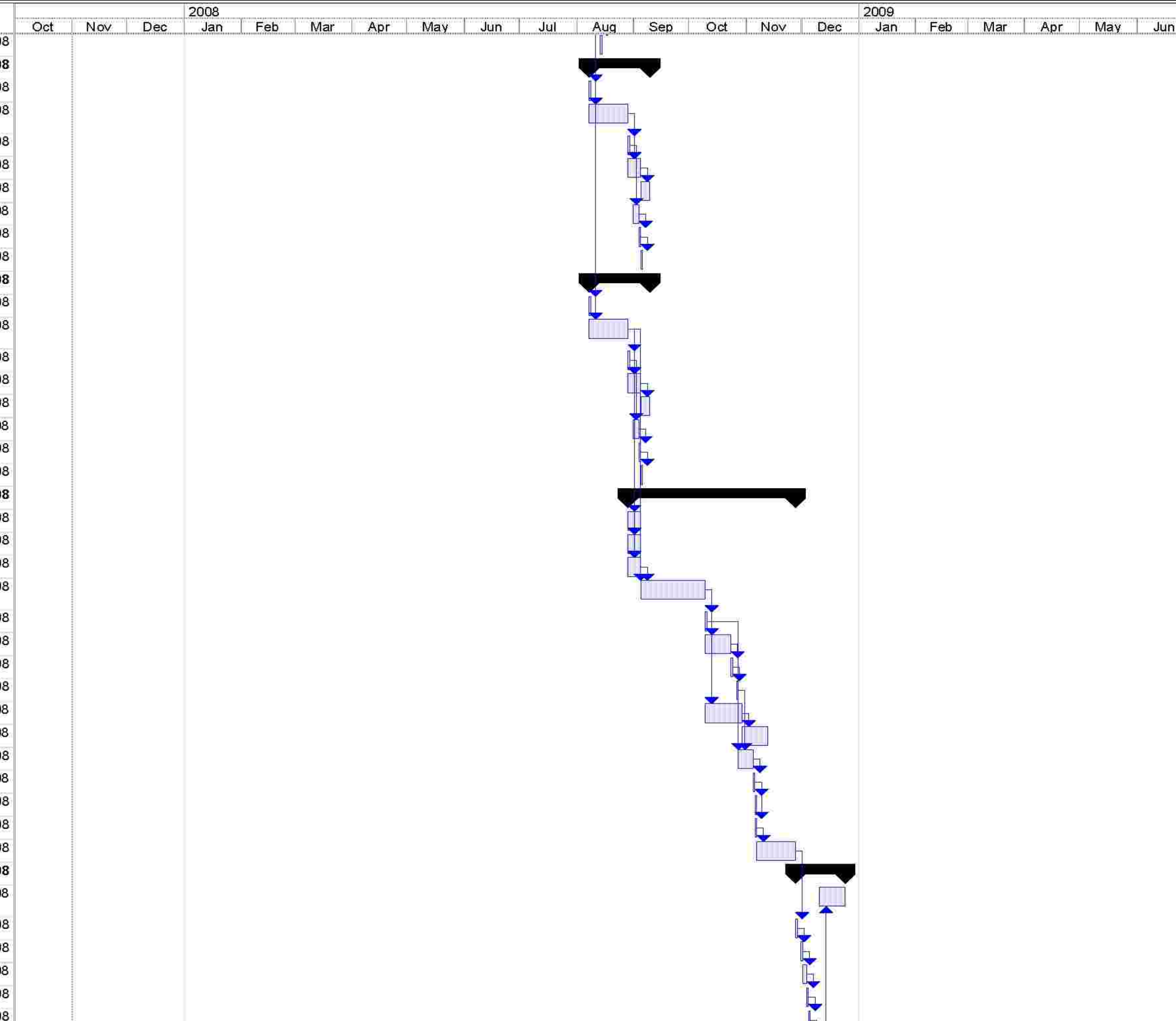
MACTEC

Corrective Action Implementation Schedule
Presidio Building 207/231 Area
Presidio of San Francisco
San Francisco, California

FIGURE
2 of 4
6-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
ACM	4084075106 02	JHD	11/07	RR	11/07

ID	Task Name	Start	Finish
79	Landscape Restoration	Thu 8/14/08	Thu 8/14/08
80	**RU 207 Corrective Action**	**Fri 8/8/08**	**Tue 9/9/08**
81	Pavement and Landscape Removal	Fri 8/8/08	Fri 8/8/08
82	Excavation, Archaeological Montioring, Confirmation Sampling, Analysis and Review	Fri 8/8/08	Thu 8/28/08
83	Excavation Record Survey	Fri 8/29/08	Fri 8/29/08
84	Waste Profile and Analysis	Fri 8/29/08	Thu 9/4/08
85	Transportation and Disposal	Fri 9/5/08	Tue 9/9/08
86	Backfill, Compaction and Grading	Mon 9/1/08	Wed 9/3/08
87	Final Record Survey	Thu 9/4/08	Thu 9/4/08
88	Landscape Restoration	Fri 9/5/08	Fri 9/5/08
89	**208 Portion of RU 207 Corrective Action**	**Fri 8/8/08**	**Tue 9/9/08**
90	Pavement Removal	Fri 8/8/08	Fri 8/8/08
91	Excavation, Archaeological Montioring, Confirmation Sampling, Analysis and Review	Fri 8/8/08	Thu 8/28/08
92	Excavation Record Survey	Fri 8/29/08	Fri 8/29/08
93	Waste Profile and Analysis	Fri 8/29/08	Thu 9/4/08
94	Transportation and Disposal	Fri 9/5/08	Tue 9/9/08
95	Backfill, Compaction and Grading	Mon 9/1/08	Wed 9/3/08
96	AC Placement	Thu 9/4/08	Thu 9/4/08
97	Final Record Survey	Fri 9/5/08	Fri 9/5/08
98	**RU 231 Corrective Action**	**Fri 8/29/08**	**Thu 11/27/08**
99	Pavement Removal	Fri 8/29/08	Thu 9/4/08
100	Reroute Fire System for Buuilding 230	Fri 8/29/08	Thu 9/4/08
101	Remove Bldg 231 Slab and SVE System	Fri 8/29/08	Thu 9/4/08
102	Excavation, Archaeological Montioring, Confirmation Sampling, Analysis and Review	Fri 9/5/08	Thu 10/9/08
103	Excavation Record Survey	Fri 10/10/08	Fri 10/10/08
104	Utility Reinstallation, Water and Sewer	Fri 10/10/08	Thu 10/23/08
105	Sewer and Water Line Testing	Fri 10/24/08	Fri 10/24/08
106	Waterline Disinfection	Mon 10/27/08	Mon 10/27/08
107	Waste Profile and Analysis	Fri 10/10/08	Wed 10/29/08
108	Transportation and Disposal	Thu 10/30/08	Wed 11/12/08
109	Backfill, Compaction and Grading	Tue 10/28/08	Tue 11/4/08
110	AC Placement	Wed 11/5/08	Wed 11/5/08
111	AC Striping	Thu 11/6/08	Thu 11/6/08
112	Final Record Survey	Thu 11/6/08	Thu 11/6/08
113	Installation of Propogule Growing Area Plus Drainage for Are:	Fri 11/7/08	Thu 11/27/08
114	**Post Excavation**	**Fri 11/28/08**	**Wed 12/24/08**
115	Post Const. Quarterly GW Monitoring and Reporting - Site Wide	Thu 12/11/08	Wed 12/24/08
116	GW Monitoring Well Installation Utility Clearance	Fri 11/28/08	Fri 11/28/08
117	GW Monitoring Well Utility Mark-Out/Review	Mon 12/1/08	Mon 12/1/08
118	GW Monitoring Well USA Notification	Tue 12/2/08	Wed 12/3/08
119	GW Monitoring Well USA Mark-Out	Thu 12/4/08	Thu 12/4/08
120	Install GW Monitoring Wells	Fri 12/5/08	Fri 12/5/08



Project: 207-231 Schedule.mpp
Date: Thu 11/1/07

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

MACTEC

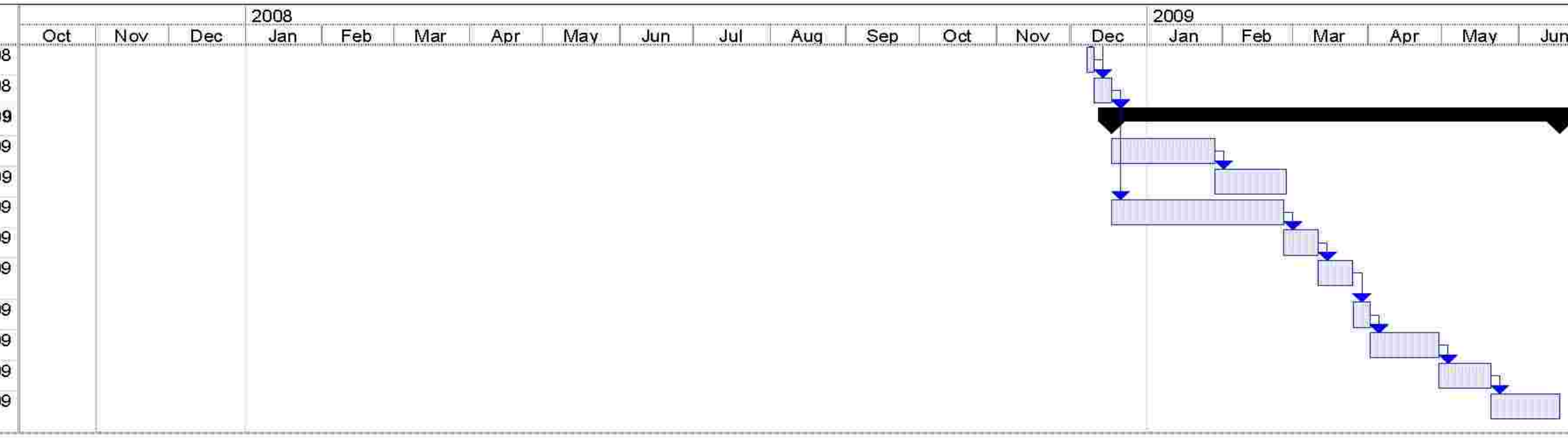
Corrective Action Implementation Schedule
Presidio Building 207/231 Area
Presidio of San Francisco
San Francisco, California

FIGURE
3 of 4

6-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
ACM	4084075106 02	JHD	11/07	RR	11/07

ID		Task Name	Start	Finish
121		Survey New GW Monitoring Wells	Mon 12/8/08	Wed 12/10/08
122		Closeout Contractor Submittal Review	Thu 12/11/08	Wed 12/17/08
123		**Prepare Record Documents (All RUs)**	**Thu 12/18/08**	**Wed 6/17/09**
124		Prepare LUCMRR Addendum All RUs-Draft	Thu 12/18/08	Wed 1/28/09
125		Prepare LUCMRR Addendum All RUs-Final	Thu 1/29/09	Thu 2/26/09
126		Construction Completion Report	Thu 12/18/08	Wed 2/25/09
127		Trust Review Construction Completion Report	Thu 2/26/09	Wed 3/11/09
128		NPS and Project Group Review of Construction Completion Report	Thu 3/12/09	Wed 3/25/09
129		Finalize Construction Completion Report	Thu 3/26/09	Wed 4/1/09
130		RWQCB Review of Construction Completion Report	Thu 4/2/09	Wed 4/29/09
131		Revise/Finalize Construction Completion Report	Thu 4/30/09	Wed 5/20/09
132		RWQCB Acceptance of Completion Report/Issues Completion Letter	Thu 5/21/09	Wed 6/17/09



Project: 207-231 Schedule.mpp
Date: Thu 11/1/07

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

MACTEC

Corrective Action Implementation Schedule
Presidio Building 207/231 Area
Presidio of San Francisco
San Francisco, California

FIGURE
4 of 4
6-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
ACM	4084075106 02	JHD	11/07	RR	11/07

APPENDIX A

STORM WATER POLLUTION PREVENTION PLAN

CONTENTS

FIGURES

A1.0 INTRODUCTION

On behalf of the Presidio Trust (Trust), MACTEC has prepared this Storm Water Pollution Prevention Plan (SWPPP) for the 207/231 site (Site), located in the Presidio (Figure A-1). MACTEC has prepared this SWPPP in accordance with the provisions of the State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit (#99-08 DWQ).

The Trust, in consultation with the NPS, plans to conduct excavation at four soil remedial units (RUs): Building 231 RU, Building 230 RU, Building 38 RU, and Building 271 RU; oxygen release compound (ORC) injection is proposed for Building 228 RU. This work is being conducted in accordance with the *Final Corrective Action Plan (CAP), Building 207/231 Area (CAP, MACTEC, 2007).*

This document presents the site background, identification of storm water sources, potential pollutant sources that may affect the quality of storm water discharges during and after construction, erosion and sediment control practices, and storm water monitoring to be deployed at the Site. The provisions of this SWPPP will apply during the construction and for the first year following construction, until MACTEC, on behalf of the Trust, submits a Notice of Termination (NOT). MACTEC will also serve as the Trust's Construction Manager for the Site.

A1.1 Site Background

The Site comprises approximately eight acres of land located in the northeastern portion of the Presidio of San Francisco, California (Presidio), adjacent to the Crissy Marsh and bisected by the Doyle Drive/Highway 101 overpasses (Figure A-1). Approximately 6 acres of the site is paved (from the southern boundary to the North Doyle Drive overpass) and the remaining 2 acres to the north of North Doyle Drive overpass is unpaved .

The United States Department of the Army (Army) historically used the Site for servicing and fueling vehicles, and contained two service/gas stations. In addition, the Site had garages, a car wash, a dry cleaning facility that used Stoddard solvent (petroleum hydrocarbon distillate), and fuel oil distribution lines. The garages, car wash, underground storage tanks (USTs), and fuel lines have since been removed and the Site currently consists of buildings, paved parking areas, roadways, and some landscaping. Several utilities both in-service and abandoned pass through the Site. A belowground 72-inch storm drain runs through the eastern portion of the Site that drains to Crissy Marsh. The surface drainage is generally to the northeast, with ground surface elevations ranging from 30 feet North American Vertical Datum (NAVD)88 datum to 10 feet NAVD88. Storm water drains into several catch basins, located on site, which transfer the collected storm water into the storm drain identified above.

A1.2 Previous Investigations

The Trust has conducted detailed studies to evaluate the nature and extent of chemical contamination at the Site; these studies are described in the CAP (*MACTEC, 2007*).

A1.2.1 Previous Soil Sampling Results

The following chemicals of concern (COCs) were detected in soils at concentrations exceeding cleanup levels in the soil RUs at the site:

- Petroleum hydrocarbons – Total Petroleum Hydrocarbons (TPH) as gasoline, diesel, fuel oil;
- Volatile Organic Compounds (VOCs) – benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tertiary butyl ether (MTBE), tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), bromobenzene, methylene chloride (MeCl);
- Polynuclear Aromatic Hydrocarbons (PAHs) – anthracene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, pyrene;
- Polychlorinated Biphenyls (PCBs) and Pesticides – Arochlor 1016, 4,4’-DDD; and
- Metals – arsenic, chromium, cobalt, copper, lead, mercury, silver, and zinc.

A1.2.2 Compliance

The NPDES General Permit requires that the SWPPP identify personnel to oversee the implementation of best management practices (BMPs) to prevent storm water pollution associated with implementing the corrective actions and to modify the SWPPP as necessary over time. MACTEC will provide the site engineering support; Stacy Sabol is MACTEC’s Project Manager and Ram Rao, P.E. is the project’s PE. The Contractor for the project is still to be identified. On behalf of the Trust, the Contractor will be responsible for implementing the SWPPP and MACTEC will be responsible for site monitoring to confirm compliance with this SWPPP. See Section A.7.0 for contact information.

A2.0 STORM WATER SOURCE IDENTIFICATION

Approximately 6 acres of the site is paved (from the southern boundary to the North Doyle Drive overpass) and the remaining 2 acres to the north of North Doyle Drive overpass is unpaved. Surface topography slopes toward the northeast, with surface elevations ranging from 35 feet NAVD88 (on the south) to 10 feet NAVD88 (on the north). Surface water drainage is primarily through overland flow toward several catch basins located within the Site; storm water collected by the catch basins are routed into the 72-inch storm drain, which drains into the Crissy Marsh. Current and “During Construction” generalized storm water flow directions are shown on Figures A-1 and A-2, respectively. Generalized flow directions following construction are shown on Figure A-3 .

A.3.0 POTENTIAL SOURCES OF POLLUTION

A.3.1 Chemicals of Concern in Soils

As discussed in Section A1.1.1, COCs in soil are: TPH as gasoline, diesel, and fuel oil, VOCs, PAHs, PCBs, pesticides, and metals. Excavated soil and waste will be disposed of in accordance with Federal and State regulations. As discussed in the *Corrective Action Implementation Work Plan* accompanying this SWPPP, excavated soil will be temporarily stockpiled onsite for characterization prior to off-site disposal. Section A.4.2 describes handling of stockpiled soil.

A.3.2 Storm Water Pollutant Discharges

Sources of storm water pollutants at the Site includes:

- <u>Staging and equipment storage area:</u> The Contractor will mobilize earth-moving equipment such as loaders and excavators to the site during construction activities. Trucks, excavators, and other construction vehicles left overnight will be parked on site. The Contractor will stage haul trucks along Mason Street to the east of Marshall Street. Leaks from equipment or ruptures of equipment liquid reservoirs (fuel, crankcase oil, gearbox oils, hydraulic oils, or radiator coolant) can release potential pollutants.
- <u>Excavation, Backfilling, Utility Relocation, and construction activities</u>: Excavation activities can release soil/sediment to storm water that may or may not be impacted with COCs.
- <u>Stockpile storage area:</u> Soil stockpiles can release soil/sediment to storm water that may be impacted with COCs.

A.3.3 Non-Storm Water Discharges

There are no non-storm water discharges at the Site.

A.4.0 EROSION AND SEDIMENT CONTROL PRACTICES

A.4.1 General Practices

The Contractor will implement BMPs such as engineering controls, scheduled inspections, maintenance, employee training, and other management activities to minimize the potential for pollutants to enter storm water. These practices conform to the recommendations described in the Association of Bay Area Governments (ABAG) publication *Manual of Sediment and Erosion Control Measures* (*ABAG, 1995*) and the RWQCB's *Erosion and Sediment Control Field Manual* (*RWQCB, 1999*). Figure A-2, Storm Water Pollution Prevention Plan, Construction Phase, shows planned erosion and sediment control practices; Figure A-3, Storm Water Pollution Prevention Plan, Restored Site, shows sediment control practices after construction completion. The Contractor will ensure that an extra supply of the engineering control materials are available onsite, which can be deployed as necessary in the event of unseasonal and heavy summer rains.

A.4.2 Onsite Sediment and Erosion Control Practices

Excavation Areas: The Contractor will:

- Use straw bales, straw wattles, silt fences, etc. until the site is repaved in paved areas.
- Use straw bales, straw wattles, silt fences, and ground cover (e.g., landscaping fabric, blown straw) in unpaved areas following excavation and prior to backfilling and following construction until the vegetative ground cover is established.
- Place a silt fence underneath the grate of the catch basins in pedestrian and/or vehicular traffic areas or straw bales around the catch basins in non-traffic areas during excavation activities.
- Adjust the location and type of erosion control materials as necessary to accommodate actual field conditions during construction.

Soil Staging Areas: Figure A-2 shows proposed locations of soil staging facilities. The Contractor will:

- Construct the soil staging facilities with 20-mil plastic liner underneath the stockpile and 10-mil plastic liner as a cover with the sides bermed with sterile weed free straw wattles.
- Cover stockpiled material in the soil staging facilities with weighted 10-mil plastic during periods when material is not being added or removed from the stockpile.
- Set up an onsite decontamination area for equipment washing, to minimize the volume of water used for decontamination and to prevent runoff.

A.4.3 Offsite Sediment and Erosion Control Practices

For soil excavated at the Site, the Contractor will:

- Load trucks from soil stockpile area (see Figure A-2 for location of stockpile).
- Spray potable water on disturbed areas as necessary to reduce dust.

A.4.4 Wind Erosion and Dust Control

As needed, the Contractor will spray potable water on the disturbed areas and active stockpiles (i.e., while loading into and out of stockpiles and when the stockpiles are uncovered) for dust control and will cover stockpiles and debris piles with plastic.

A.4.5 Management Practices for Construction Vehicles and Equipment

The Contractor will conduct activities in conformance with the following guidelines to minimize vehicle/equipment contact with storm water:

- Berm minor spills such as fuel from vehicles or other heavy equipment with soil and clean using dry absorbent materials.
- Cover the spill if it is raining to avoid runoff.
- Properly dispose wastes associated with spill cleanup.

The Contractor will use the following practices during equipment and vehicle maintenance, vehicle fueling, and washing of construction vehicles:

Equipment and Vehicle Maintenance: The Contractor will:

- Maintain construction equipment to prevent oil or other fluid leaks.
- Clean vehicles and equipment to prevent excessive buildup of oil and grease.
- Use off-site repair shops.
- Keep spill cleanup materials accessible.
- Inspect on-site vehicles and equipment regularly for leaks and repair problems immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids; prevent leaking vehicles or equipment from entering the site.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids.

Rumble Pads to Prevent Track Out: The trucks will be staged on a paved surface along Old Mason Street, either just west of Building 610 or east of Marshall Street. The trucks will access the site (and the stockpile area) along paved surfaces. Therefore, it is not anticipated that the trucks will track significant dirt.

As a contingency, however, rumble pads will be placed at the site exit for trucks to prevent offsite tracking of dirt. No wet washing of tires will be conducted.

Fueling: For refueling, the Contractor will:

- Primarily use EPA approved double wall tanks to be located in the contractor equipment storage and refueling area depicted on Figure A-2 .

For spill containment, the Contractor will:

- Place spill kits (containing gloves, goggles, absorbent pillows, pads, and socks) near each fuel tank and inside each excavator to contain liquid spills in case of a release. The spill kits will consist of a lever lock top for quick access and a bright yellow label for high visibility.

A.4.6 Post-Construction Erosion Control

Figure A-3 shows post-construction erosion-control measures that include one or more of the following for the unpaved areas:

- Bionet all-natural fabric (or equivalent);
- Straw wattles made of sterile weed free rice straw; and
- Sterile weed free straw bales, ground cover, etc.

The Trust will adjust the location and type of erosion control materials necessary to accommodate field conditions. The Trust, in consultation with NPS, will assure that erosion control measures are maintained until post construction vegetation has matured and artificial erosion control measures are not required. The Trust or its contractor will monitor post-construction erosion control measures. MACTEC, on behalf of the Trust, will file a NOT under the General Permit after construction has been completed and post-construction erosion control measures have been installed.

A.5.0 STORM WATER MONITORING PROGRAM

The purpose of this storm water monitoring program is to comply with the General Permit and evaluate the effectiveness and proper implementation of onsite BMPs in limiting the discharge of pollutants to storm water runoff.

A.5.1 Training

MACTEC as the Trust's Construction Manager will train its field staff and those of the Contractor regarding SWPPP requirements, including inspection, actions necessary to implement BMPs, and reporting. Section A.6.0 includes a form that documents persons who have been trained in the required inspection and reporting requirements.

A.5.2 Site Inspection Procedures

MACTEC will oversee periodic inspections of the storm water system BMPs (described in Section A.4.0) and potential sources of pollution (described in Section A.3.0) using staff familiar with SWPPP requirements and trained to identify non-compliance activities. MACTEC will review inspection data to determine if any changes are required to maintain compliance with the conditions of the General Permit and will take corrective actions, if required.

During construction, inspections will be conducted weekly, and prior to and after storm events. MACTEC will also conduct storm water monitoring for a year following construction. During the winter months, MACTEC will conduct weekly inspection. For the remainder of the year, MACTEC will conduct monthly inspection. MACTEC will maintain inspection records that include inspection dates, locations, observations, and any measures taken to reduce or prevent storm water pollution.

MACTEC and Contractor field staff will use the presence of significant sediment load in stormwater runoff as an indicator of the presence of potential COCs in runoff during a storm event, as COCs in soil

are primarily present in the adsorbed phase (i.e., attached to sediment particles) rather than the dissolved phase. No storm water sampling is recommended because erosion control measures described in Section A.4.0 should minimize potential for erosion of soils/sediment (and downslope transport of COCs) from the site during excavation activities. The Construction Manager will evaluate the effectiveness of BMPs and make adjustments if significant sediment load is detected in storm water runoff down slope of the installed silt fences.

A.5.3 Record Keeping and Reporting

A.5.3.1 Non Compliance Reporting

MACTEC will report all instances of non compliance with this SWPPP and General Permit to the RWQCB by telephone as soon as the discharge has been observed. MACTEC, on behalf of the Trust, will send a written report within 14 calendar days of violation. Non compliance reports will include:

- Type(s) of non compliance;
- The BMPs currently being implemented;
- Description of actions undertaken and/or necessary to achieve compliance; any additional BMPs, which will be implemented to prevent future non compliance; and
- Estimated implementation schedule for corrective actions.

A.5.3.2 Record Keeping

The Trust will:

- Amend this plan as necessary during implementation;
- Maintain storm water inspection forms and training documentation for at least six years in accordance with the General Permit; and
- Document the SWPPP implementation in a letter report to the RWQCB following the completion of construction activities.

A.6.0 ACKNOWLEDGMENT PAGE

This section includes names and signatures of persons who have been trained in the required inspection and reporting requirements of this plan.

"I am aware of storm water pollution prevention management practices, and I understand the contents of this SWPPP and the General Permit. I have also been trained in the inspection and reporting procedures outlined in this SWPPP."

NAME	**SIGNATURE**	**DATE**

A.7.0 CONTACTS

In case of emergency, contact the following:

MACTEC (Engineer and Construction Manager):

Construction Manager: TBD

Project Engineer: Ram Rao, P.E.
Office: (510) 451-1011
Fax: (510) 451-3165
Cell: (510) 414-9315

Address: 600 Grand Avenue, Suite 300
Oakland, California 94610

Project Manager: Stacy Sabol
Office: (415) 278-2107
Fax: (415) 777-9706

Address: 28 Second Street, Suite 700
San Francisco, California 94105

Presidio Trust (Owner)

Remediation Project Manager: Ryan Seelbach
Office: (415) 561-5082
Fax: (415) 561-2132

Street Address and UPS/Fed Ex Mailing:
67 Martinez Street
San Francisco, California 94129

USPS Mail:
34 Graham Street
Post Office Box 29052
San Francisco, California 94129

National Park Service

Environmental Project Manager: Brian Ullensvang
Office: (415) 561-4726
Fax: (415) 561-4727
Cell: (510) 710-7034

Street Address:
Fort Mason Building 101
San Francisco, California 94123

Mailing Address:
Fort Mason Building 201
San Francisco, California 94123

The Contractor (To Be Decided)

A.8.0 REFERENCES

Association of Bay Area Governments (ABAG), 1995. *Manual of Sediment and Erosion Control Measures.*

MACTEC Engineering and Consulting, Inc. (MACTEC), 2007a. *Final Corrective Action Plan, Building 207/231 Area, Presidio of San Francisco, California, October*.

_____, 2007b. *Revised Draft Corrective Action Implementation Work Plan, Building 207/231 Area, Presidio of San Francisco, California.* November.

Regional Water Quality Control Board (RWQCB), 1999. *Erosion and Sediment Control Field Manual.*

State Water Resources Control Board (SWRCB), 2004. State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) General Permit (# 99-08 DWQ). August.

FIGURES

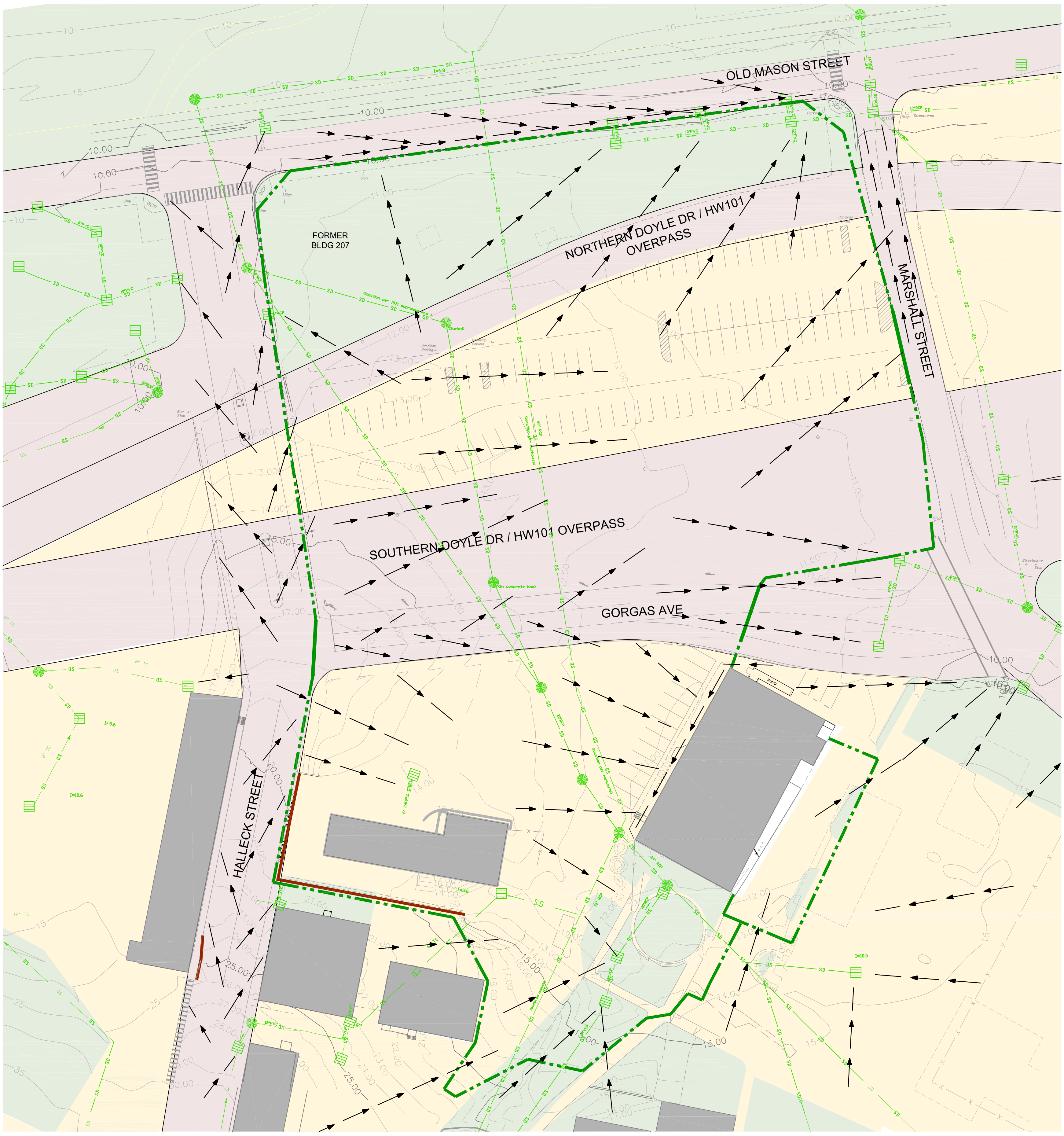
CERTIFICATION PAGE

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

REGISTERED PROFESSIONAL ENGINEER
RAMKISHORE
C61467
Expires 06/30/09
CIVIL
STATE OF CALIFORNIA

Ramkishore Rao, P.E.

11/2/07
Date



LEGEND

HISTORIC WALL		STORM DRAIN	SD
TOPOGRAPHIC CONTOUR	24	PERIMETER FENCE	
STREET PAVED ASPHALT AREA		STORM DRAIN MANHOLE	
UNPAVED AREA		STORM DRAIN INLET	
LIGHT USE ASPHALT PAVED AREA		STORMWATER FLOW LINES	
EXISITNG BUILDINGS			

N

40 0 40 80

SCALE IN FEET

4084075106032.DWG 1.0
20070803.1115

MACTEC

STORM WATER POLLUTION PREVENTION PLAN
EXISTING CONDITION
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE

A-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

LEGEND

HISTORIC WALL

TOPOGRAPHIC CONTOUR

STREET PAVED ASPHALT AREA

UNPAVED AREA

LIGHT USE ASPHALT PAVED AREA

EXISITNG BUILDINGS

STOCKPILE STAGING AREA

STORMWATER FLOW LINES

FILTER FABRIC SET BENEATH DRAIN INLET IN STREET

STRAW WATTLE AROUND DRAIN INLET SET IN CURB

STRAW WATTLE AROUND DRAIN INLET

STORM DRAIN

TEMP. ABOVE GROUND STORM DRAIN

PERIMETER FENCE

ASSUMED EXCAVATION AREA

STORM DRAIN TO BE REMOVED

STORM DRAIN MANHOLE

40 0 40 80

SCALE IN FEET

4084075106033.DWG 1.0
20071019.0842

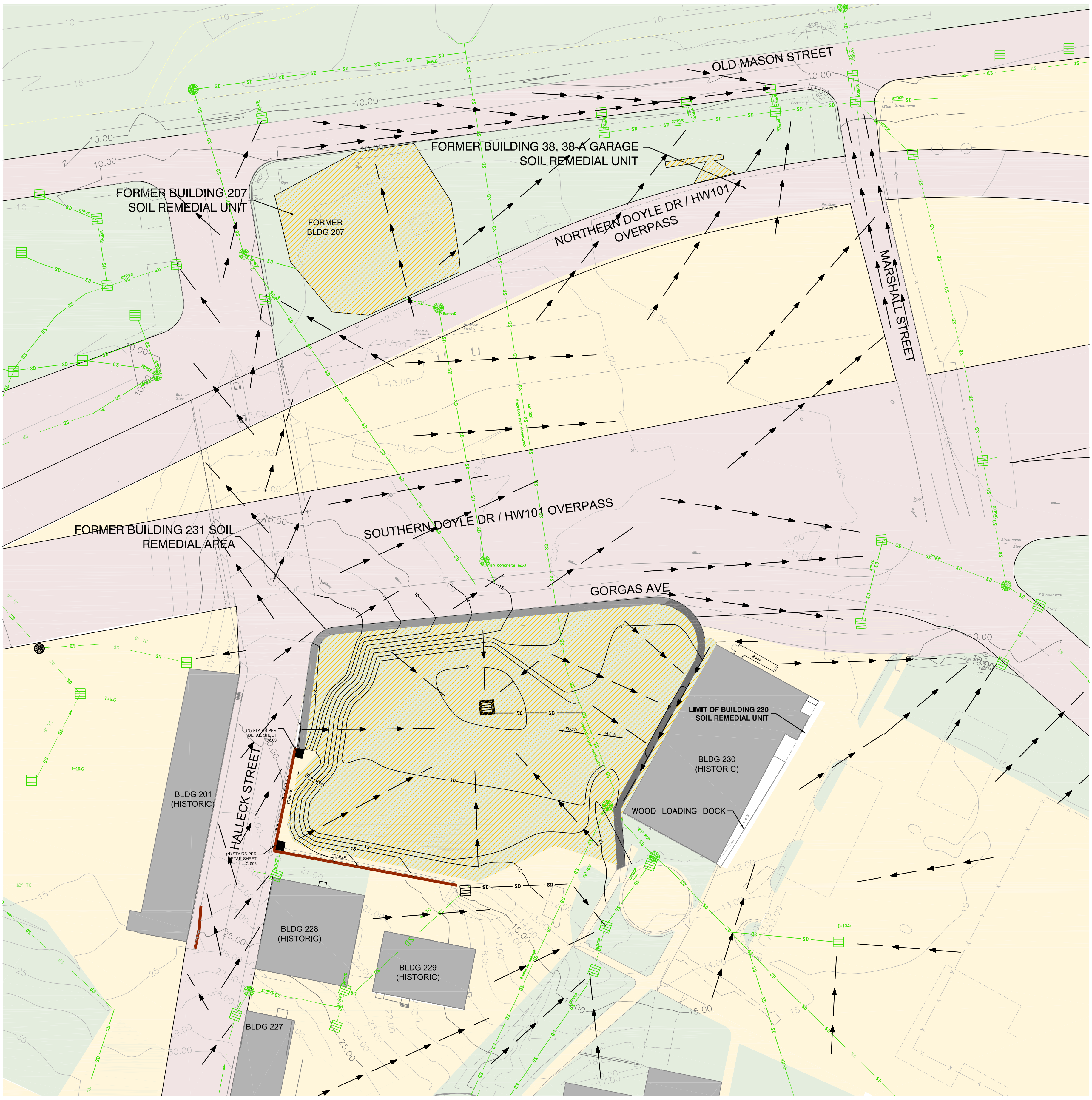
MACTEC

STORM WATER POLLUTION PREVENTION PLAN
CONSTRUCTION PHASE
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE

A-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



LEGEND

HISTORIC WALL	
TOPOGRAPHIC CONTOUR	24
NEW TOPOGRAPHIC CONTOUR	24
STREET PAVED ASPHALT AREA	
UNPAVED AREA	
LIGHT USE ASPHALT PAVED AREA	
EXISITNG BUILDINGS	
NEW AC PATH AT GRADE	
NEW RAISED AC PATH	
STORMWATER FLOW LINES	
STORM DRAIN DI	
NEW STORM DRAIN DI	
STRAW WATTLE AROUND NEW STORM DRAIN DI	
STORM DRAIN	SD
NEW BELOW GROUND STORM DRAIN	SD
EROSION COLTROL MATERIALS TO BE PLACED AS NEEDED	
STORM DRAIN MANHOLE	

N

40 0 40 80

SCALE IN FEET

4084075106034.DWG 96.0
20071019.0949

MACTEC

STORM WATER POLLUTION PREVENTION PLAN
RESTORED SITE
PRESIDIO BUILDING 207/231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
A-3

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

APPENDIX B

TRAFFIC CONTROL AND SIGNAGE GUIDE

CONTENTS

FIGURES

B1.0 TRAFFIC CONTROL AND SIGNAGE GUIDE

B1.1 Background

The Presidio Trust (Trust) will be removing contaminated soil from four of the five soil remedial units (RUs) at the Building 207/231 Area (Site). Soil RUs where excavation will be performed are the 230 RU, 38 RU, 207 RU, and 231 RU. Oxygen release compound injection will be conducted at the 228 RU.

At the RUs where excavation is to be conducted, after the materials are removed and transported off-site, the site will be backfilled as illustrated on the Construction Documents and as described in the Work Plan. These activities are anticipated to be conducted during Summer 2008. A goal of this project is to remove the impacted material while minimizing potential construction impacts to local roadways and traffic and Site users.

B1.2 Project Area

Temporary construction fencing will be placed around the project area, which is bounded by Building 228 to the south, eastern edge of Building 230 RU to the east, Mason Street to the north, and Halleck Street to the west (Figure B-1). Construction equipment routes will be typically limited to within the fenced area. No Presidio street traffic will be allowed within the fenced area.

B1.3 Information Signs

The Trust will prepare signs explaining the purpose, extent, and approximate schedule of the removal operations and install them adjacent to the site work areas.

B1.4 Truck Routes

Proposed truck haul routes are shown on Figure B-1 (Truck Haul Routes Plan).

Truck Entrance Routes:

- Enter the Presidio through the Gorgas Gate or Richardson Slip Ramp
- Follow Gorgas Avenue or Richardson Avenue respectively to the Site
- Turn right on Marshall Street and proceed to the staging area at the corner of Marshall and Mason
- Enter site through gate on a temporary construction fence along Marshall Street.

Loaded Truck Exit Routes:

- Loaded trucks will exit the Site east on Gorgas Avenue
- Turn north on Marshall Street
- Turn east on Mason Street
- Turn south on Marina Boulevard
- Turn west on Doyle Drive to Highway 101.

B1.4 Traffic Information and Detour Signs

Gorgas Avenue will be closed between Marshall Street and Halleck Street during work at the 231 RU. Signs will be used to direct traffic around the site. Cautionary signs to be placed at and in the vicinity of the Project Area are depicted on Figure B-2 (Transportation Plan).

B1.5 Pedestrian Restrictions

During construction, pedestrians will not be permitted within the fenced area. A flag person will be present at each of the entrances (gates) into the Project Area when trucks need to come in and out of the Project Area. Signs will be placed along Gorgas Avenue, Mason Street, Halleck Street, and Marshall Street directing pedestrians to use caution and watch for trucks in the area.

B1.6 Post-Construction Signage

The Trust will develop text and sign designs and proposed locations for post-construction signs and fences. Details will be finalized during the construction phase. Signs will be prepared by the Trust sign shop and will be installed by sign shop personnel.

FIGURES

LEGEND

PRIMARY TRUCK HAUL ROUTE	
ALTERNATIVE TRUCK HAUL ROUTE	
ASSUMED EXCAVATION AREAS	
PERIMETER FENCE	

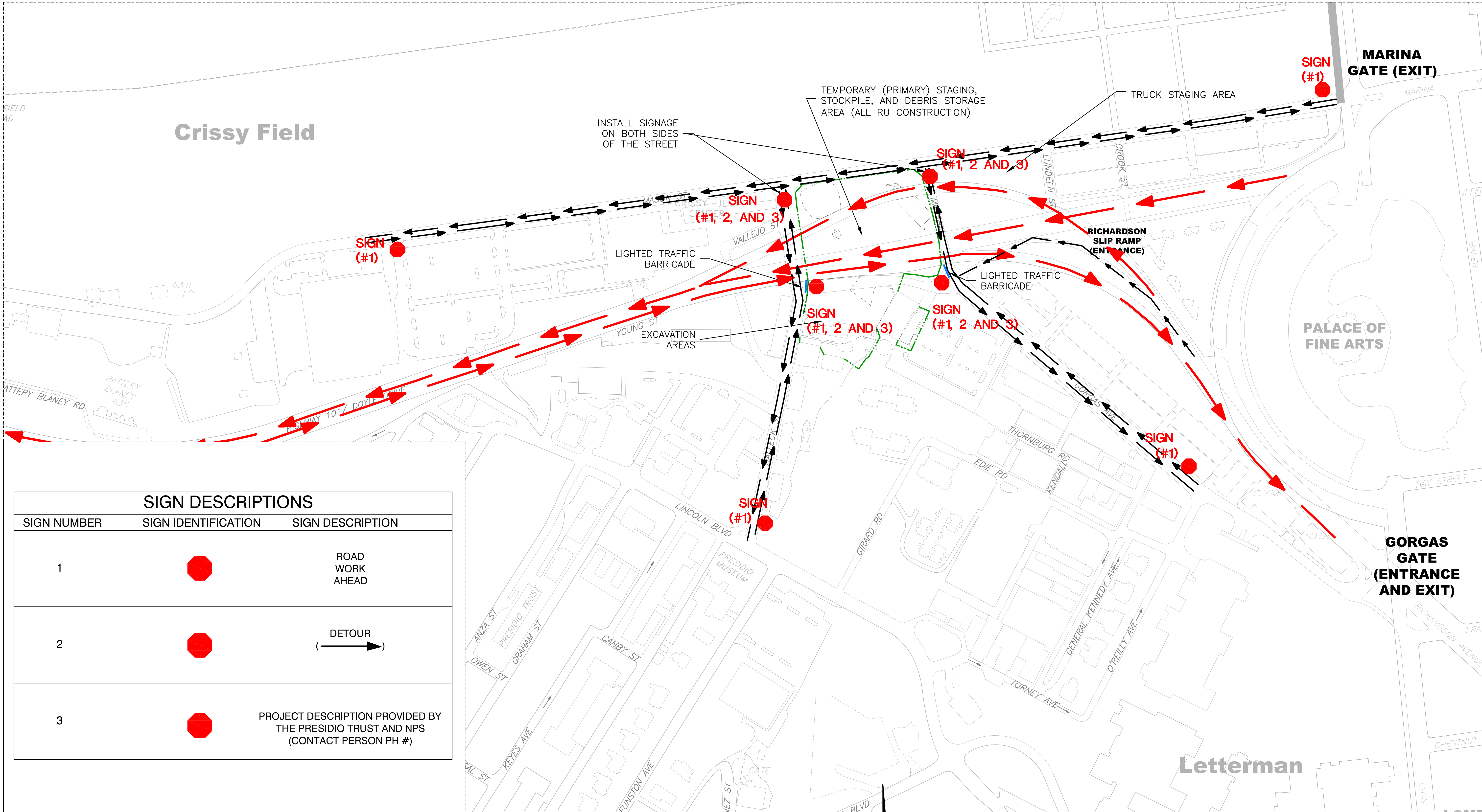
100 0 100 200
SCALE IN FEET

MACTEC

TRUCK HAUL ROUTE PLAN
PRESIDIO BUILDING 207-231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
B-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



SIGN DESCRIPTIONS

SIGN NUMBER	SIGN IDENTIFICATION	SIGN DESCRIPTION
1	(red octagon)	ROAD WORK AHEAD
2	(red octagon)	DETOUR (——→)
3	(red octagon)	PROJECT DESCRIPTION PROVIDED BY THE PRESIDIO TRUST AND NPS (CONTACT PERSON PH #)

LEGEND

- DOYLE DRIVE/HWY 101 OVERPASS TRAFFIC
- TWO DIRECTIONAL CITY STREET TRAFFIC
- ASSUMED EXCAVATION AREAS
- PERIMETER FENCE
- TRAFFIC SIGN
- LIGHTED TRAFFIC BARRICADE

N

150 0 150 300
SCALE IN FEET

MACTEC

TRANSPORTATION PLAN
PRESIDIO BUILDING 207-231 AREA
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

B-2

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

APPENDIX C

DEWATERING PLAN

CONTENTS

ATTACHMENTS

C1.0 DEWATERING PLAN

This Dewatering Plan is an outline of dewatering operations that will be implemented during the Construction Phase of the project. This plan describes the practices to manage the discharge of pollutants when non-storm water (groundwater) and accumulated precipitation (storm water) must be removed from the site so that construction work may be accomplished. Storm water mixed with non-storm water will be managed as non-storm water.

C1.1 Objectives

The objective of this Dewatering Plan is to appropriately and safely manage the water that is encountered during construction activities at the site. Specifically, the Contractor will:

- dewater excavations only when necessary (i.e., during excavation and/or backfilling) so that work may progress.
- assure that collected water is stored on-site under safe conditions until testing can be completed to allow for disposal of the water.
- assure that all collected water is disposed in accordance with all applicable laws, local permits, project-specific permits, and regulations.

C1.2 Anticipated Groundwater Extraction Rates and Groundwater Storage Requirements

MACTEC estimates that approximately 1 to 5 gallons per minute (gpm) will be produced during the excavations at all the soil remedial units. Because the Project Area will be fenced off, not allowing access to the excavation areas by pedestrians and vehicular traffic, this plan proposes groundwater extraction only during construction (i.e., excavation, and/or backfilling, etc.). As such, over a construction workday of 12 hours and for groundwater extraction rates of 1 to 5 gpm, approximately 720 gallons to 3,600 gallons of water will be produced during construction each day. Up to two baker tanks, each with a capacity of 21,000 gallons, will be used to store water onsite for the duration of construction, pending collection of wastewater samples and testing to confirm compliance with the Trust's Industrial Wastewater Discharge Permit. The locations of the baker tanks are depicted on Figure 1-2 of the Work Plan.

C1.3 Dewatering Approach During Construction Phase

The Contractor shall:

- Install a dewatering system to control surface waters and lower and control groundwater table levels and hydrostatic pressures to allow excavation, backfill, and compaction to be performed in compliance with the Work Plan.
- Maintain stability of excavation and surrounding features.

It is anticipated that the Contractor will use thrash pumps to transfer extracted water from the excavation to the baker tank(s). No pumped wells are anticipated. If pumped wells are necessary, then MACTEC

will provide the Trust, the NPS, and other stakeholders, a design of the pumped well system in a weekly stakeholder meeting for review and approval prior to implementation.

C1.4 Discharge and/or Disposal of Extracted Groundwater

For discharge of extracted water, the Contractor shall comply with the Trust's Industrial Waste Water Discharge Permit (Class II Waste water Permit No. 05-0246) issued by the San Francisco Department of Public Works (see attached permit).

MACTEC will sample the extracted water from the tanks once every month for the analytes listed in the Trust's Industrial Waste Water Discharge Permit. Provided the concentrations are below the discharge limits, the Contractor will discharge the extracted water to the Trust's sanitary sewer system (see Figure 1-2 for manhole to be used for discharge of the extracted water).

However, if the concentrations of any of the analytes exceed discharge limits, then the Contractor will identify off-site disposal facilities to be used for discharge of water. The Contractor will provide MACTEC, the Trust, the NPS, and other stakeholders, a plan for offsite disposal of the water in weekly stakeholder meetings for review and approval prior to arranging for offsite disposal.

ATTACHMENT 1

PRESIDIO TRUST, INDUSTRIAL USER CLASS II WASTEWATER PERMIT
(PERMIT NO. 05-246)

REVIEWED: RR

THE PRESIDIO TRUST

1750 Lincoln Boulevard
San Francisco, California 94129-0052
415/561-5082 fax 561-2132 rseelbach@presidiotrust.gov

FACSIMILE TRANSMITTAL SHEET

TO: Gary Lieberman	FROM: Ryan Seelbach
ORGANIZATION: Mactec	DATE: December 13, 2005
FAX NUMBER: 707.793.3900	TOTAL NO. OF PAGES INCLUDING COVER: 14
PHONE NUMBER:	

RE:
Industrial User Class II WW Permit

θ URGENT θ FOR REVIEW θ PLEASE COMMENT θ PLEASE REPLY θ PLEASE RECYCLE

NOTES/COMMENTS:
Gary – Odd pages are coming next.

Thanks, Ryan - 415.561.5082

SFPUC
WATER
HETCH HETCHY
WATER & POWER
CLEAN WATER

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
Bureau of Environmental Regulation and Management
3801 THIRD STREET, SUITE 600, SAN FRANCISCO, CA 94124 • Tel. (415) 695-7310 • Fax (415) 695-7388

February 7, 2005

SUBJECT: Industrial User Class II Wastewater Permit

Dear Permittee:

Your application for an industrial wastewater discharge permit has been reviewed and processed in accordance with Section 125 of Chapter X (Public Works Code) of Part II of the San Francisco Municipal Code, Article 4.1 (hereinafter referred to as "Article 4.1").

The enclosed Industrial User Class II Wastewater Permit covers all wastewater discharges from your facility into the City and County of San Francisco's (City's) sewerage system. If you wish to appeal or challenge any conditions imposed in this permit, an application for a variance from the strict application of the requirements of Article 4.1 must be filed. However, according to the provisions of Section 128 of Article 4.1, the General Manager may grant variances only when such action is consistent with Article 4.1's general purpose and intent, and the general and specific rules contained in that ordinance.

If you dispose of process wastewater, spent processing solutions, cartridges, filters, residues, sludges or chemicals by offsite hauling, please note the record-keeping requirements specified in Part II-I of the permit.

If you have any questions about the permit requirements, please contact Stephen Todd at (415) 695-7368.

Very truly yours,

Tommy Lee, Division Engineer
Environmental Regulation
and Management

Enclosure

SFPUC
WATER
HETCH HETCHY
WATER & POWER
CLEAN WATER

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
Bureau of Environmental Regulation and Management
3801 THIRD STREET, SUITE 600, SAN FRANCISCO, CA 94124 • Tel. (415) 695-7310 • Fax (415) 695-7388

PERMIT NO. 05-0246

INDUSTRIAL USER CLASS II WASTEWATER PERMIT

Discharger: Presidio Water Treatment Plant
1773 Gibson Rd.
Presidio of San Francisco, CA 94129

SIC/ID: 4941/02008

Pursuant to the provisions of Sections 120, 124 and 125 of Chapter X (Public Works Code) of Part II of the San Francisco Municipal Code, Article 4.1 (hereinafter referred to as "Article 4.1"), it is hereby ordered that the above industrial user/permittee is authorized to discharge wastewater, from the indicated business address, into the City and County of San Francisco's (City's) sewerage system, provided that such wastewater discharges are performed through the facility's approved side sewer(s), and are in accordance with the conditions set forth in this **Class II Wastewater Permit**.

Compliance with this permit does not relieve the permittee of its obligation to comply with any or all applicable pretreatment regulations, standards or requirements under local, state and federal laws, including any such regulations, standards, requirements, or laws which may become effective during the term of this permit. Noncompliance with any condition of this permit shall constitute a violation of Article 4.1.

Effective date of permit: February 7, 2005
Re-application date: November 6, 2009
Expiration date of permit: February 6, 2010

By: Steven C. Medbery
Steven C. Medbery, Manager
Environmental Regulation
and Management

Date: February 7, 2005

Part I - WASTEWATER EFFLUENT LIMITATIONS AND PROHIBITIONS

A. During the period of February 7, 2005 to February 6, 2010, the permittee is authorized to discharge all wastewater through the approved side sewer(s) from the facility.

B. During the effective period of this permit, any sample representative of the permittee's **wastewater discharges to the side sewer(s)** shall not at any time exceed the following numerical limitations, which are contained in Section 123 of Article 4.1:

1. Based upon any grab sample[1] of the permittee's wastewater:

Pollutant parameter	Limit
pH	6.0 min.; 9.5 max.
Dissolved Sulfides	0.5 mg/L
Temperature (except where higher temperatures are required by law)	125°F (52°C)
Hydrocarbon Oil and Grease	100 mg/L

2. Based upon grab samples of the permittee's wastewater, flow-weighted over a production week[2]:

Pollutant parameter	Limit
Total Recoverable Oil and Grease	300 mg/L

C. During the effective period of this permit, any sample representative of the permittee's **wastewater discharges to the side sewer(s)** shall not exceed the following numerical limits, which are contained in the City's Department of Public Works (DPW) Order No. 158170 (1991), which is incorporated by reference in this permit:

1. Based upon 24-hour composite sampling[3]:

---

[1] *A "**grab sample**" means an individual sample of wastewater collected over a period of time not exceeding 15 minutes, as defined in federal regulations at 40 CFR Part 403.7(d)(2)(iv)(1990).*

[2] *A "**production week**" means the typical number of days in a calendar week when wastewater is discharged from routine operation and/or cleanup of the permittee's facility.*

Pollutant parameter	Limit (mg/L)
Arsenic (T)	4.0
Cadmium (T)	0.5
Chromium (T)	5.0
Copper (T)	4.0
Lead (T)	1.5
Mercury (T)	0.05
Nickel (T)	2.0
Silver (T)	0.6
Zinc (T)	7.0

[Where T = Total]

2. Based upon grab sampling:

Pollutant parameter	Limit (mg/L)
Cyanide (T)	1.0
Phenols	23.0

D. The permittee shall not discharge wastewater containing radioactive materials unless the following conditions are satisfied:

1. The permittee obtains a permit from the General Manager[4] of the San Francisco Public Utilities Commission (SFPUC) for the discharge of radioactive materials;

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[3] *"**24-hour composite sampling**" means sampling which is performed over an approximate 24 hour period extending over two consecutive days. Wastewater discharge may not be continuous during the sampled period. A "**composite sample**" means a sample that is collected over time, formed either by continuous sampling or by mixing discrete samples. The sample may be composited either as a **time-composite sample**, i.e. composed of discrete sample aliquots collected in one container at constant time intervals, providing representative samples irrespective of stream flow, or as a **flow-proportional composite sample**, i.e. collected either as a constant sample volume at time intervals proportional to stream flow, or collected by varying the volume of each aliquot as the flow varies while maintaining a constant time interval between the aliquots.*

[4] *"General Manager" means the General Manager of the San Francisco Public Utilities Commission, or a designated representative of the General Manager.*

2. The permittee is authorized to use radioactive materials by the Nuclear Regulatory Commission[5] or other governmental agency empowered to regulate the use of radioactive materials; and

3. The radioactive material is discharged in strict conformity with all Nuclear Regulatory Commission or other governmental agency requirements.

E. The permittee shall not discharge, deposit, throw, cause, allow or permit to be discharged, deposited or thrown into the City's sewerage system[6], any substance of any kind whatever, including oxygen demanding pollutants, that may or will in any manner cause "interference"[7] or "pass through"[8], obstruct or damage the sewerage system, cause a nuisance, interfere with the proper operation, repair or maintenance of the sewerage system, interfere with the proper operation, repair or maintenance of a reclaimed water production or distribution facility, create difficulty for any workers to repair or maintain any part of the sewerage system, or directly or indirectly cause a violation of the City's federal or state sewage discharge permits or any other requirement applicable to the City. Such substances include, but are not limited to the following:

1. Ashes, cinders, sand, gravel, dirt, bark, leaves, grass cuttings and straw, metals, glass, ceramics and plastics, or any other solid or viscous substance capable of causing obstruction to the flow in sewers, or that will not be carried freely under the flow conditions normally prevailing in the City's sewerage system;

2. Any flammable or explosive substances;

3. Any corrosive substances (particularly discharges with pH lower than 5.0), which will cause structural damage to the City's sewerage system;

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[5] *The "Nuclear Regulatory Commission" is an agency of the federal government.*

[6] *The "sewerage system" means all public facilities for collecting, transporting, treating, and disposing of stormwater and pollutants in wastewater. The sewerage system includes facilities owned and operated by public entities other than the City, where such facilities direct wastewater into the sewerage system and are subject to the jurisdiction of the City as defined by law, contract or interjurisdictional agreement.*

[7] *"Interference" means an inhibition or disruption of the sewerage system, treatment processes or operations, or sludge processes, including the use or disposal of sludge, which causes or threatens to cause a violation of any requirement of the City's permits to operate sewage treatment facilities as defined by state or federal laws and regulations. Violations include, but are not limited to, an increase in the magnitude or duration of a violation and the prohibition of City use or disposal of sludge.*

[8] *"Pass through" means a discharge which enters receiving waters through the sewerage system in quantities or concentrations which alone, or in combination with a discharge or discharges from other sources, causes or threatens to cause a violation of the City's NPDES permits, including an increase in the magnitude or duration of a violation.*

4. Garbage, excepting properly ground garbage discharged in accordance with Article 4.1, from dwellings and restaurants or other establishments engaged in the preparation of foods and beverages;

5. Any toxic, hazardous (as defined in the California Code of Regulations at Title 22, or in federal regulations at 40 CFR Part 261), noxious or malodorous substance which either singly or by interaction with other wastes may or will prevent maintenance of the sewerage system or create a nuisance or hazard to the safety of the public or City employees;

6. Any bioaccumulative toxic substance[9] that exceeds the "soluble threshold limit concentration (STLC)"[10];

7. Any wastewater, in temperature or quantity, which will cause the temperature of influent to exceed 104°F (40°C) at the point of introduction to any City wastewater treatment plant; and

8. Any liquids, solids or gases or any discharge that may cause damage or harm to any reclaimed water facility, or that may limit or prevent any use of reclaimed water authorized by Title 22 of the California Code of Regulations.

F. The permittee shall not discharge without a permit any pollutants, except stormwater, directly into a manhole, catch basin, or other opening in the sewerage system other than through an approved side sewer.

G. The permittee shall not increase the use of process water or, in any other way, attempt to dilute a discharge as a partial or complete substitute for adequate treatment to achieve compliance with the requirements of Article 4.1.

H. The permittee shall not discharge groundwater or water from sumps or dewatering facilities into the sewerage system without a permit. An application for a permit pursuant to this paragraph shall be submitted to the General Manager no later than 45 days prior to the proposed commencement of the discharge. Each permit for groundwater discharge shall contain appropriate discharge standards and any other appropriate requirements that must be achieved before discharge into the sewerage system may commence. Such discharges shall be subject to payment of sewer service charges in accordance with the

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[9] *A "**bioaccumulative toxic substance**" means a toxic substance that concentrates in living organisms through direct assimilation or accumulation in the food chain, as defined in Title 22, California Code of Regulations and any amendments thereto.*

[10] *The "**soluble threshold limit concentration** (STLC)" means the concentration of a solubilized and extractable bioaccumulative or persistent toxic substance, which, if equaled or exceeded in a waste, renders the waste hazardous as defined in Title 22, California Code of Regulations and its amendments.*

provisions of applicable City laws. The General Manager may require the permittee to install and maintain meters, at the permittee's expense, to measure the volume of the discharge.

I. The permittee shall not discharge wastewater associated with groundwater cleanup or remediation plans without first obtaining a permit. An application for a permit pursuant to this paragraph shall be submitted to the General Manager no later than 45 days prior to the proposed commencement of the discharge. A permit may be issued only if an effective pretreatment system on the process stream is maintained and operated. Each permit for such discharge shall contain appropriate discharge standards based on Article 4.1 and reports or data provided by the permittee, as well as any other appropriate requirements that must be achieved at the time the discharge commences. Such discharges shall be subject to payment of sewer service charges in accordance with the provisions of applicable City laws. The General Manager may require the permittee to install and maintain meters, at the permittee's expense, to measure the volume of the discharge. The General Manager may require that such permittees shall indemnify and hold harmless the City from any and all costs, claims, damages, fines, remediation costs, losses and other expenses arising from the discharge into the sewerage system.

J. The permittee may discharge wastewater associated with asbestos abatement operations without a permit, provided that the wastewater has been pretreated through a system that provides for removal of waterborne asbestos.

K. In addition to the provisions of Article 4.1, all discharges by the permittee into the City's sewerage system shall comply with all requirements set forth in federal categorical pretreatment standards, applicable state orders and water quality control regulations, sewage discharge permits and orders issued to the City by federal and state agencies, federal and state pretreatment approval conditions, local discharge limitations and regulations promulgated by the General Manager and the City, including any such regulations, limitations, orders, permits, standards, requirements, or laws which may become effective during the term of this permit.

Part II - MONITORING REQUIREMENTS AND SPECIAL CONDITIONS

A. To determine the permittee's compliance with the limitations of Part I above, all wastewater sampling and measurements, which are representative of the nature and volume of the wastewater discharges, shall be performed at the approved side sewer(s) from the facility. The monitoring point(s) may be designated upstream from where the permittee's wastewater discharges into the City's sewerage system, if access at the discharge location(s) is not feasible, or if the permittee's wastewater merges with the discharge from another facility, before entering the City's sewerage system.

B. The permittee may be required to construct, in accordance with current City standards and at the permittee's expense, a monitoring facility in each side sewer, or in areas further upstream on the permittee's property, for wastewater monitoring purposes.

C. The permittee shall ensure that each designated monitoring point is safe, convenient and accessible to authorized City employees.

D. All compliance sampling and analysis shall be performed in accordance with techniques and procedures approved by the EPA pursuant to section 304(g) of the Clean Water Act and contained in 40 CFR Part 136 and amendments thereto, or otherwise approved by the EPA.

E. The permittee may be required to perform self-monitoring of the wastewater discharges. Such self-monitoring shall be performed at a frequency and for such pollutant parameters as required by the General Manager.

F. The permittee may be required to install and maintain meters to continually measure and record the flow rate of the wastewater discharges.

G. The permittee may be required to perform wastewater treatment on its own site prior to discharge into the sewerage system. Where a wastewater treatment system is employed, the permittee shall ensure that a trained operator is on duty during each operating shift of the facility.

H. The permittee shall store all hazardous materials (e.g. corrosives, flammables etc.) and hazardous wastes within a bermed area or by using some other method of secondary containment, to prevent spills from entering the City's sewerage system.

I. If the permittee disposes of process wastewater, spent processing solutions, cartridges, filters, residues, sludges or chemicals by offsite hauling, the following records shall be kept for periodic review and verification by authorized City inspectors:

1. Receipts and/or purchase records for processing chemicals;

2. Hazardous waste manifests or other documentation for process wastewater, spent processing solutions, cartridges, filters, residues, sludges or chemicals hauled offsite; and

3. A record of the type and quantity of process wastewater, spent processing solutions, cartridges, filters, residues, sludges or chemicals generated at the facility.

Part III - REPORTING REQUIREMENTS

A. **Within 60 days** of the effective date of this permit, the permittee shall develop and submit (unless previously submitted) to the General Manager:

1. A manual (or self-developed set of instructions) on the proper operation and maintenance of any wastewater treatment system utilized in the facility;

2. A drawing showing a flow diagram and the components of the wastewater treatment system; and

3. Any required information, which has not been submitted in the permittee's wastewater permit application. The permittee will be informed of the deficiency under separate cover.

B. **Within 60 days** of the effective date of this permit, the permittee shall complete and submit (unless previously submitted) to the General Manager a checklist for a Spill Prevention Control and Countermeasures (SPCC) plan, showing facilities and operating procedures to provide protection against spills or accidental discharges of prohibited or regulated materials.

C. **Within 60 days** of the effective date of this permit, the permittee shall complete and submit (unless previously submitted) to the General Manager a checklist for a Hazardous Waste Reduction Assessment[11] (HWRA) of the facility.

Based upon the contents of the checklist submitted, the permittee may subsequently be required to submit a detailed HWRA, including an accounting of the quantities of certain critical chemicals discharged to the sewers, a plan for reducing the amount of critical chemicals discharged, and a report on previous reductions.

D. **Within 60 days** of the effective date of this permit, the permittee shall complete and submit (unless previously submitted) to the General Manager a checklist for a Stormwater Pollution Prevention Plan[12] (SPPP) for the facility.

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[11] *A "**hazardous waste reduction assessment**" means a systematic planned procedure with the objective of identifying ways to reduce or eliminate hazardous waste. Waste reduction describes the reduction, to the extent feasible, of hazardous waste that is generated or subsequently treated, stored or disposed of. It includes any source reduction or recycling activity undertaken by a generator that results in either (1) the reduction of total volume or quantity of hazardous waste or (2) the reduction of toxicity of the hazardous waste, or both.*

[12] *A "**stormwater pollution prevention plan**" has as its major objectives: (a) to help identify the sources of pollution that affect the quality of stormwater discharges associated with industrial activity; and (b) to describe and ensure the implementation of practices to reduce pollutants in stormwater discharges associated with industrial activity.*

E. The permittee shall notify the General Manager, **within 24 hours**, of any violation detected during self-monitoring, of an applicable effluent limitation. Upon the detection of any such violation, the permittee shall re-sample and submit both sets of analytical results within 30 days of the initial detection.

F. Where the permittee conducts self-monitoring or is given split wastewater samples by the City, copies of the analytical results shall be submitted to the General Manager **within 30 days** of the completion of the sampling episode.

G. The permittee shall notify the General Manager at least **30 days prior** to the introduction of new wastewater discharges or pollutants, or any substantial change in volume (i.e. 25 percent or greater variance from the monthly average flow) or characteristics of the wastewater being introduced into the sewerage system, from its industrial activities. The permittee shall certify that the change will not result in noncompliance with the requirements of Part I above. The General Manager may require the issuance of an amended permit before the commencement of such altered discharge, or, in the case of termination of operations, details regarding closure operations.

H. The permittee shall notify the General Manager at least **30 days prior** to the termination of operations. The notification shall include a facility closure and maintenance report, which describes the procedures to be implemented (e.g. disposal of processing baths) to prevent discharges in noncompliance with the requirements of Part I above.

I. All reports (**which must include the certification statement contained in Part IV-N**) and correspondence to the General Manager shall be submitted to the following address:

Mr. Steven C. Medbery, Manager
SFPUC-BERM
Bayview Plaza
3801 - 3rd Street, Suite 600
San Francisco, CA 94124

Part IV - STANDARD CONDITIONS

A. Duty to Comply

The permittee must comply with all conditions of this permit. Failure to comply with the requirements of this permit may be grounds for administrative action, including suspension or revocation of this permit, or enforcement proceedings, including civil or criminal penalties, injunctive relief, and severing of the side sewer connection(s).

B. Duty to Re-apply

The permittee must request a renewal or extension of this permit by submittal of a new or revised application at least 90 days before the expiration date of this permit. The General Manager will notify the permittee about the re-application requirement; however, it is the permittee's obligation to re-apply in a timely manner.
An expired permit will continue to be effective and enforceable until the permit is re-issued if:

1. The permittee has satisfied the re-application requirements; and

2. The failure to re-issue the permit in a timely manner is not due to any act, or failure to act, on the part of the permittee.

C. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or correct any adverse impact on the sewerage system or the environment, resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

D. Duty to Halt or Reduce Activity

In the event of reduction of efficiency of operation, or loss or failure of all or part of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control its production or discharges (or both) until operation of the treatment facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power to the treatment facility fails or is reduced. It shall not be a defense for the permittee, to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

E. Operation and Maintenance of Pollution Controls

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes, but is not limited to: effective performance, adequate funding, adequate operator training and staffing, adequate back-up or auxiliary equipment, and adequate laboratory and process controls, including appropriate quality assurance procedures. The permittee shall maintain a record of such servicing for inspection by authorized City inspectors.

F. Bypass of Treatment Facilities

1. Bypass[13] is prohibited unless it is unavoidable to prevent loss of life, personal injury, or severe property damage, and no feasible alternatives (such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime) exist.

2. The permittee may allow bypass to occur provided it does not cause effluent limitations to be exceeded, but only if it is for essential maintenance, to ensure efficient facility operations.

3. Notification of bypass:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, at least 10 days before the date of the bypass, to the General Manager.

   b. Unanticipated bypass. The permittee shall notify the General Manager within 24 hours of becoming aware of the bypass. This 24-hour notice must be followed within 5 days by a written description of the bypass, its cause, its duration (or, if it has not been corrected, how long it is expected to continue), and what has been done to rectify the problem.

G. Operating Upsets

Any upset[14] experienced by the permittee shall be reported to the General Manager within 24 hours of becoming aware of the upset. A formal written report shall be submitted to the General Manager within 5 days. The report shall include:

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[13] *A "bypass", as defined in 40 CFR Part 403.17, means the intentional diversion of wastestreams from any portion of the permittee's treatment facility.*

[14] *An "upset", as defined in 40 CFR Part 403.16 (a), means an exceptional incident in which there is unintentional and temporary noncompliance with categorical pretreatment standards because of factors beyond the reasonable control*

1. A description of the industrial discharge and cause of noncompliance;

2. The period of noncompliance, including exact date(s) and time(s), or if not corrected, the anticipated time the noncompliance is expected to continue; and

3. Steps being taken and/or planned to reduce, eliminate and prevent recurrence of the noncompliance.

If the permittee fails to report the upset within 5 days, the permittee shall have waived the right to future claim that the noncompliance was due to an upset. If the permittee wishes to establish the affirmative defense of upset to any enforcement action brought for noncompliance, the permittee shall demonstrate, through properly signed contemporaneous operating logs or other relevant evidence that:

a. An upset occurred and the permittee can identify the cause(s) of the upset; and

b. The facility was at the time being operated in a prudent and workman-like manner, and in compliance with applicable operation and maintenance procedures.

H. Slug Loading

The permittee shall verbally notify the General Manager immediately upon the occurrence of an accidental discharge or threatened discharge of a "slug loading"[15] to the sewerage system, resulting from a spill or upset on the permittee's premises. A formal written report, addressing circumstances and remedies shall be submitted to the General Manager within 5 working days of the occurrence. The report shall specify:

1. A description of the nature and cause of the accidental discharge, spill, upset or slug loading. The description should also include location, type, concentration and volume of the discharge;

2. The duration of the discharge, including exact date(s) and time(s), and, if the discharge is continuing, the time by which cessation of the discharge is reasonably expected to occur; and

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of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

[15] *A "slug loading" means any pollutant (including oxygen demanding pollutants) released in a discharge at a flow rate and/or concentration which will cause a violation of the specific prohibitions listed in 40 CFR Part 403.5(b). (See Part I)*

3. All steps taken to reduce, eliminate, and/or prevent recurrence of such a discharge, spill, upset or slug loading.

Such notification and report shall not relieve the permittee of liability for any expenses, including but not limited to, costs for countermeasures, loss or damage to the sewerage system, liability for fines imposed upon the City because of such occurrences, liability for fines or damages because of such occurrences, or for any damages incurred by a third party.

I. Proper Disposal of Sludges. Spent Chemicals etc.

The disposal of sludges, spent chemicals and hazardous wastes generated by the permittee shall be done in accordance with Section 405 of the Clean Water Act, Subtitles C and D of the Resource Conservation and Recovery Act, and Title 22 of the California Code of Regulations.

J. Hazardous Materials/Waste Storage

The permittee shall store all hazardous materials and hazardous waste within a diked or bermed area, or by using some other method of secondary containment, to prevent spills from entering the sewerage system.

K. Hazardous Waste Discharge

The permittee shall notify the General Manager, the United States Environmental Protection Agency (EPA) Regional Waste Management Division Director, and the California State hazardous waste authorities, in writing, of any discharge into the City's sewerage system of a substance, which, if otherwise disposed of, would be a hazardous waste under federal regulation at 40 CFR Part 261. (See Appendix A, "Hazardous Waste Discharge Response Addresses & Telephone Numbers".)

In the case of any notification made under this paragraph, the permittee shall certify that it has a hazardous waste management/waste minimization program in place, for reducing the volume and toxicity of hazardous wastes generated, to the degree that the permittee has determined to be economically practical.
When the permittee generates a hazardous waste discharge as cited above, it shall report the following:

1. The name of the hazardous waste as set forth in 40 CFR Part 261;
2. The EPA hazardous waste number; and
3. The type of discharge (continuous, batch or other).

If the permittee discharges more than 100 kilograms of such waste per calendar month into the City's sewerage system, the notification shall also contain the following information, to the extent such information is known and readily available to the permittee:

4. An identification of the hazardous constituents contained in the wastes;

5. An estimation of the mass and concentration of such constituents in the waste streams discharged during that calendar month; and

6. An estimation of the masses and concentrations of such constituents expected to be discharged in the wastewater during the following 12 months.

Notwithstanding any other requirement of this Part, the permittee shall provide the notification no later than 15 days after the discharge of the listed or characteristic hazardous waste. **These notification requirements do not apply to pollutants already reported in other self-monitoring reports required in Part III.**

L. Right to Enter Premises

Upon the presentation of proper credentials, employees authorized by the General Manager, when necessary for the performance of their duties, shall have the right to enter the permittee's premises. Such authorized personnel shall, at all reasonable hours, be allowed access to any facilities and records necessary for determining compliance, including, but not limited to the ability to:

1. Copy any records, inspect any monitoring equipment, and sample and monitor any wastewater subject to regulation under Article 4.1; and

2. Inspect the permittee's process areas, chemical and waste storage areas and process activities.

Reasonable hours, in the context of inspection and sampling, include any time the permittee is engaged in any activity, which results in wastewater discharge into the City's sewerage system. Notwithstanding any provisions of law, authorized personnel shall be allowed entry to the permittee's premises **at any time**, if the General Manager determines that an imminent hazard to persons or property exists on, or as a result of activities conducted on, the permittee's premises.

M. Duty to Provide Information

The permittee shall submit to the General Manager, within 15 working days, any information which the General Manager may request to determine whether cause exists for modifying, revoking and re-issuing, or terminating this permit; or to determine compliance with this permit.

N. Signatory Requirements

All applications, reports, or information submitted to the General Manager by the permittee **must** contain the following certification statement and **must** be signed by an authorized representative as described below:

> **"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."**

1. By a responsible corporate officer, if the permittee submitting the reports is a corporation. For the purpose of this paragraph, a responsible corporate officer means:

   a. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

   b. The manager of one or more manufacturing, production, or operation facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

2. By a general partner or proprietor if the permittee submitting the reports is a partnership or sole proprietorship respectively.

3. By a duly authorized representative of the individual designated in paragraph 1. or 2. of this section if:

   a. The authorization is made in writing by the individual described in paragraph 1. or 2.;

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the facility from which the industrial discharge originates, such as the position of plant manager, operator of a well, or well field superintendent, or a position of equivalent

responsibility, or having overall responsibility for environmental matters for the company; and

c. The written authorization is submitted to the General Manager.

4. If an authorization under paragraph 3. of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, or overall responsibility for environmental matters for the company, a new authorization satisfying the requirements of paragraph 3. of this section must be submitted to the General Manager prior to or together with any reports to be signed by an authorized representative.

O. Confidentiality of Information

1. Any records, reports, or information submitted by the permittee to the General Manager, whether made in writing or by communication incorporated in SFPUC reports, shall be available to the public, except upon a showing made by the permittee, satisfactory to the General Manager, that public disclosure of records, reports or information which the General Manager or other authorized personnel has received would divulge methods or processes entitled to protection as confidential trade secrets. All such records, reports, or information at any time may be disclosed to other authorized city personnel or any local, state or federal agency.

2. Whenever the General Manager makes a written request or orders that the permittee furnish information, the request or order shall include a notice that states that:

   a. The permittee may assert a business confidentiality claim covering specified information; and

   b. If no such claim accompanies the information when the General Manager receives it, it may be made available to the public without further notice to the permittee.

3. In assessing the validity of a business confidentiality claim, the General Manager shall determine whether the information is entitled by statute or judicial order to confidential treatment. In the absence of such a finding, the General Manager shall make the information available for public disclosure.

4. Notwithstanding any other provisions of the above, the permittee's wastewater data is not confidential and shall be made available to the public without restriction.

P. Retention of Records

Copies of any reports that must be submitted to the General Manager by the permittee pursuant to Part III above, shall be retained by the permittee for a minimum of 5 years and shall be made available for inspection and copying by the General Manager or any state or federal agency. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the permittee or the operation of the City's pretreatment program, or when requested by any state or federal agency.

Q. Charges for Sewerage System Impairment

The permittee shall reimburse the City for extraordinary costs, in addition to the applicable sewer service charge, for treatment, pumping, maintenance of the sewerage system, administration, incidental expenses, inspection and monitoring, and payment of penalties imposed on the City by enforcement agencies, caused by the specific characteristics of any discharge from the permittee's premises into the sewerage system. If the discharge of an industrial waste from the permittee's premises causes an obstruction, damage or other impairment to the sewerage system, the permittee shall pay to the City an amount equal to the costs, penalties and other incidental fees and expenses.

R. Permit Termination

This permit may be terminated, revoked or suspended for reasons including, but not limited to:

1. Falsifying self-monitoring reports;
2. Tampering with monitoring equipment;
3. Refusing to allow timely access to the permittee's facility premises and records;
4. Failure to meet effluent limitations, or the requirements of Article 4.1 and all applicable City, state and federal laws;
5. A discharge or a threatened discharge that may present a hazard to the public health, safety, welfare, natural environment, or sewerage system;
6. Failure to pay fines;
7. Failure to pay sewer service charges; and
8. Failure to meet compliance schedules.

8. Revision of or a grant of variance from such categorical standards pursuant to 40 CFR Part 403.13 of the General Pretreatment Regulations;

9. Typographical or other errors in the permit;

10. Transfer of ownership and/or operation of the permittee's facility to a new owner/operator; and

11. Upon request of the permittee, provided such request does not create a violation of any applicable requirements, standards, laws, or rules and regulations.

The filing of a request by the permittee for a permit modification or re-opening, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

U. <u>Property Rights</u>

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local regulations.

V. <u>Severability</u>

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is for any reason held to be unconstitutional or invalid or ineffective by any court of competent jurisdiction, such decision shall not affect the validity or effectiveness of the remaining portions of this permit.

W. <u>Penalties</u>

1. Criminal Penalties. Under Section 133(a) of Article 4.1, any person who violates any provision of Article 4.1 is guilty of a misdemeanor and upon conviction shall be fined in an amount not exceeding $1,000 or be imprisoned in County Jail for not more than six months, or both. Each day each violation is committed or permitted to continue shall constitute a separate offense.

   Any person who knowingly makes any false statement or misrepresentation in any record, report plan, or other document filed with the General Manager, or tampers with or knowingly renders inaccurate any monitoring device or sampling and analysis method required under Article 4.1, shall be punished by a fine of not

S. Limitation on Permit Transfer

Re-assignment or transfer to a new owner/operator may be approved by the General Manager, provided that:

1. The original permittee gives at least 30 days advance notice to the General Manager, specifying the exact date of change of ownership/operation; and

2. The new owner/operator submits a written certification that:

   a. States that no immediate change of the facility's operations and processes is proposed;

   b. Confirms the exact date on which the transfer is to occur; and

   c. Acknowledges full responsibility for complying with the existing permit.

T. Permit Modification or Re-opening

The terms and conditions of this permit may be subject to modification or re-opening by the General Manager for good causes including, but not limited to, the following:

1. Any new limitations or requirements identified in revisions or amendments to Article 4.1;

2. Additional conditions resulting from any new or revised federal or state pretreatment standards or requirements;

3. Any material or substantial alterations or additions to the permittee's operation processes, or discharge volume or character which were not considered in drafting the effective permit;

4. A change in any condition in either the permittee or the sewerage system, which requires either a temporary or permanent reduction or elimination of the authorized discharge;

5. Information indicating that the permitted discharge poses a threat to the City's sewerage system, or personnel, or the receiving waters;

6. Violations by the permittee of any terms or conditions of the permit;

7. Misrepresentation or failure to disclose fully all relevant facts in the permit application or in any required reporting;

more than $25,000 or by imprisonment in County Jail for not more than six months, or both.

2. Civil Penalties. Under Section 133(b) of Article 4.1, any person who, without regard to intent or negligence, causes or permits any discharge of wastewater or hazardous waste, as defined in Title 22, California Code of Regulations and its amendments, into the City's sewerage system, except in accordance with all permit requirements and other provisions of Article 4.1; violates any provision of a cease and desist order or cleanup and abatement order issued by the General Manager; or violates any requirement or prohibition of Article 4.1, shall be liable civilly to the City in an amount not to exceed $10,000 per day for each violation that occurs.

For intentional or negligent violations, the person so deemed shall be liable civilly to the City in an amount not to exceed $25,000 per day for each violation that occurs.

3. Administrative Civil Penalties. Under Section 133(c) of Article 4.1, notwithstanding Section 133(b), any person who, without regard to intent or negligence, causes or permits any discharge of wastewater or hazardous waste, as defined in Title 22, California Code of Regulations and its amendments, into the City's sewerage system, except in accordance with all permit requirements and other provisions of Article 4.1; violates any provision of a cease and desist order or cleanup and abatement order issued by the General Manager; or violates any requirement or prohibition of Article 4.1, shall be liable civilly to the City in an amount not to exceed $1,000 per day for each violation that occurs.

Notwithstanding Section 133(b), for intentional or negligent violations, the person so deemed shall be liable civilly to the City in an amount not to exceed $2,000 per day for each violation that occurs.

APPENDIX A

Hazardous Waste Discharge Response Addresses & Telephone Numbers

APPENDIX D

PROTOCOLS FOR ARCHAEOLOGICAL ARTIFACTS

PROTOCOLS FOR CONTAMINATED ARCHAEOLOGICAL ARTIFACTS ON PRESIDIO PARK LANDS

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PROTOCOLS FOR CONTAMINATED ARCHAEOLOGICAL ARTIFACTS ON PRESIDIO PARK LANDS

1.0 PURPOSE

This document provides guidance to archaeologists on Presidio park lands who may encounter artifacts contaminated with metals (e.g., lead) and organic contaminants (e.g., TPH, PCBs, and PAHs). Its purpose is to assist archaeologists in the safe handling, processing, and curation of these remains.

These protocols must be used in concert with professionally prepared health and safety plans (HASPs) for both field and lab work. It is essential that field archaeologists read and comply with the HASP for their work site.

These protocols, together with the HASP, will help the archaeologist:

- assess which artifacts should be collected and which recorded then discarded in the field
- safely handle and package artifacts to be returned to the lab
- safely process and store artifacts.

2.0 ARTIFACT COLLECTION AND RETENTION POLICIES

The protocols for ITC's archaeological program (ITC 1996) contain guidance for archaeologists monitoring earth-moving in the Presidio and the treatment of artifacts that result from these activities. This document requires collecting a representative "sample" of monitoring finds and retaining all materials from archaeological contexts that are deemed eligible to the National Register of Historic Places. The procedures include the following statements:

- When a discovery is made in the course of monitoring an excavation and the discovery consists of individual artifacts or artifact scatters that lack a meaningful context… the cultural materials collected in such a situation will be packaged together in an archival-quality reclosable plastic bag and labeled under this general provenience.
- Materials not intended for permanent curation… (i.e., pieces of modern trash) will be quantified, briefly described, then discarded.
- Cultural materials that are found to be contaminated that are non-porous will be decontaminated to the levels considered safe [for handling and storage].
- Cultural materials found to be contaminated but which cannot be decontaminated to levels considered safe due to their porosity, will be packaged and labeled with appropriate warnings. (ITC 1996:9.3)

2.1 Deciding to Retain or Discard Artifacts

ITC's protocols assume that all potentially important materials can and should be retained. As a practical matter, the expense and hazards associated with curating a large number of contaminated artifacts or a single highly contaminated object may be disproportional to the items' long research or interpretive value as defined in the project research design. While some items may retain a level of residual contamination that would justify their discard once adequately documented in the lab, others can be simply recorded in the field. This decision is at the discretion of the appropriate Presidio park archaeologist.

When artifacts are discovered, the archaeologist (and, where appropriate, the archaeological collections specialist) shall

- apply the decision tree (Figure 1), which specifies the conditions under which archaeological artifacts will be retained by field personnel and passed on to the archaeological laboratory for treatment;
- handle, package, and store artifacts according to the procedures outlined in this document.

3.0 ARTIFACT HANDLING, PROCESSING, AND CURATION PROCEDURES

This section guides archaeological personnel in their handling of artifacts at each phase of work: discovery, processing, and storage/curation.

3.1 Artifact Material Types

Figure 2 lists the types of materials that can be anticipated on Presidio archaeological sites. Artifacts made of these substances may have come into contact with hazardous materials and become contaminated. The extent of this contamination depends, among other factors, on the porosity of the material of which the artifacts are made. These material types vary greatly in their relative porosity. While the contamination of a non-porous artifact may be limited to the object's surface and removed with relative ease, a porous artifact may retain residual contamination within its interstices. Consequently, the safe handling and treatment of contaminated objects is, in many cases, contingent on their porosity as well as on the contaminant type (i.e., metals contamination is less likely to result in residual contamination post-cleaning as compared to organic contamination).

3.2 Handling Artifacts during Fieldwork, Processing, and Curation

Figure 3 describes the manner in which materials of various porosities are to be handled in the field and lab during processing and curation. While these procedures are intended to minimize harm to workers, the artifacts themselves may suffer if the procedures are not thoughtfully applied. In most cases, standard professional archaeological and conservation practices can be applied. The following guidance addresses special problems that may arise from the particular requirements of the HASP or the handling procedures presented in this document.

3.2.1 Decontamination in the field

Contaminated artifacts must be decontaminated before they are forwarded to the lab. An exception may be made for material of intrinsic value whose treatment requires procedures that can only be carried out in the lab. In this case, the materials must be packaged appropriately and clearly labeled with the type of suspected contaminant. All artifacts suspected of being contaminated must be packaged to confine the contaminant before they enter the lab.

3.2.2 Removing surface dirt

As sediments may contain contaminants, it is important to remove excess surface dirt from artifacts in the field by

- brushing or scraping, as appropriate
- washing with plain water
- cleaning with a solution of Alconox or similar mild detergent, as appropriate

Cleaning with a detergent will, in many cases, decontaminate non-porous and some semi-porous artifacts and allow them to be handled using standard archaeological methods. It is important not to soak porous or semi-porous material or to remove surface treatments (such as decals) during washing or cleaning.

Plain water used to free artifacts of surface dirt may be reused by allowing sediments to accumulate in a series of settling tanks and recirculating the water by a pump. This process of extracting artifacts from their encasing matrix may create or release byproducts that may themselves contain contaminants. These byproducts include

- contaminated water used to clean artifacts
- sediments that accumulate in the settling tanks
- ferrous metal encrustations

These byproducts must be handled, stored, and disposed of according to the HASP and Presidio waste storage policies.

3.2.3 Devitrification

Glass hydrates as it is exposed to the air and eventually may devitrify, becoming crazed and flaky. The scale that is created in this process may be harmful and can enter the skin through contact. Glass that shows signs of devitrification—such as iridescence—should be handled with disposable gloves.

3.2.4 Water-saturated materials

Porous and semi-porous materials from waterlogged environments should not be dried in the field. Excess liquids that may contain contaminants should not be collected and must be handled in accordance with HASP procedures. However, the artifact's current humidity level should be maintained while it is transported to the lab. In the case of fresh water saturation, this may be achieved by adding de-ionized water.

3.2.5 Discarding artifacts in the field

In some cases, a field decision may be made to discard certain artifacts rather than decontaminating and returning them to the lab. In this case, the materials may be simply recorded appropriately and placed back into the excavation.

3.2.6 Lab processing

In most cases, artifacts will have been decontaminated in the field before entering the lab. If contaminated materials must be brought into the lab they must be separated from the remainder of the collection. The type of suspected contaminant must be clearly marked on the outside of the box or other container. These artifacts must be handled in accord with the HASP.

When it is necessary to clean and decontaminate artifacts in the lab, arrangements must be made to dispose of any contaminated byproducts before they are created. These byproducts must be handled, stored, and disposed of according to the HASP and Presidio waste storage and disposal policies. When the decision is made in the lab to discard contaminated artifacts, these items must also be disposed of according to Presidio waste storage and disposal policies.

Contaminated artifacts may only be submitted for curation in exceptional circumstances and with the permission of the Presidio archaeologist. In this case, the artifacts must be packaged to confine the contaminant and the type of contamination must be clearly marked on the outside of the box or container.

3.2.7 Curation

Federal curation standards at 36CFR79 require that archaeological remains be handled, stored, cleaned, and conserved in a manner that protects them from breakage and possible deterioration from adverse temperature and relative humidity, visible light, ultraviolet radiation, dust, soot, gases, mold, fungus, insects, rodents and general neglect, as well as preserving data that may be studied in future laboratory analyses.

In most cases, contaminated artifacts will have been treated in the field or lab. Thus, handling these materials after curation should not require special measures in addition to standard archaeological curation practices. Any contaminated artifacts must be handled in accord with the HASP.

REFERENCES

36 Code of Federal Regulations Part 79
Curation of Federally Owned and Administered Archaeological Collections (Authority: 16 US Code 470 et seq.)

International Technology Corporation (ITC)
1996 Archaeological Protocols, IT Archaeological Program, Presidio of San Francisco, San Francisco, California. IT Corporation, Martinez, CA, prepared for USA Corps of Engineers, Sacramento. CA.

Figure 1. Decision Procedures for the Collection of Archaeological Artifacts

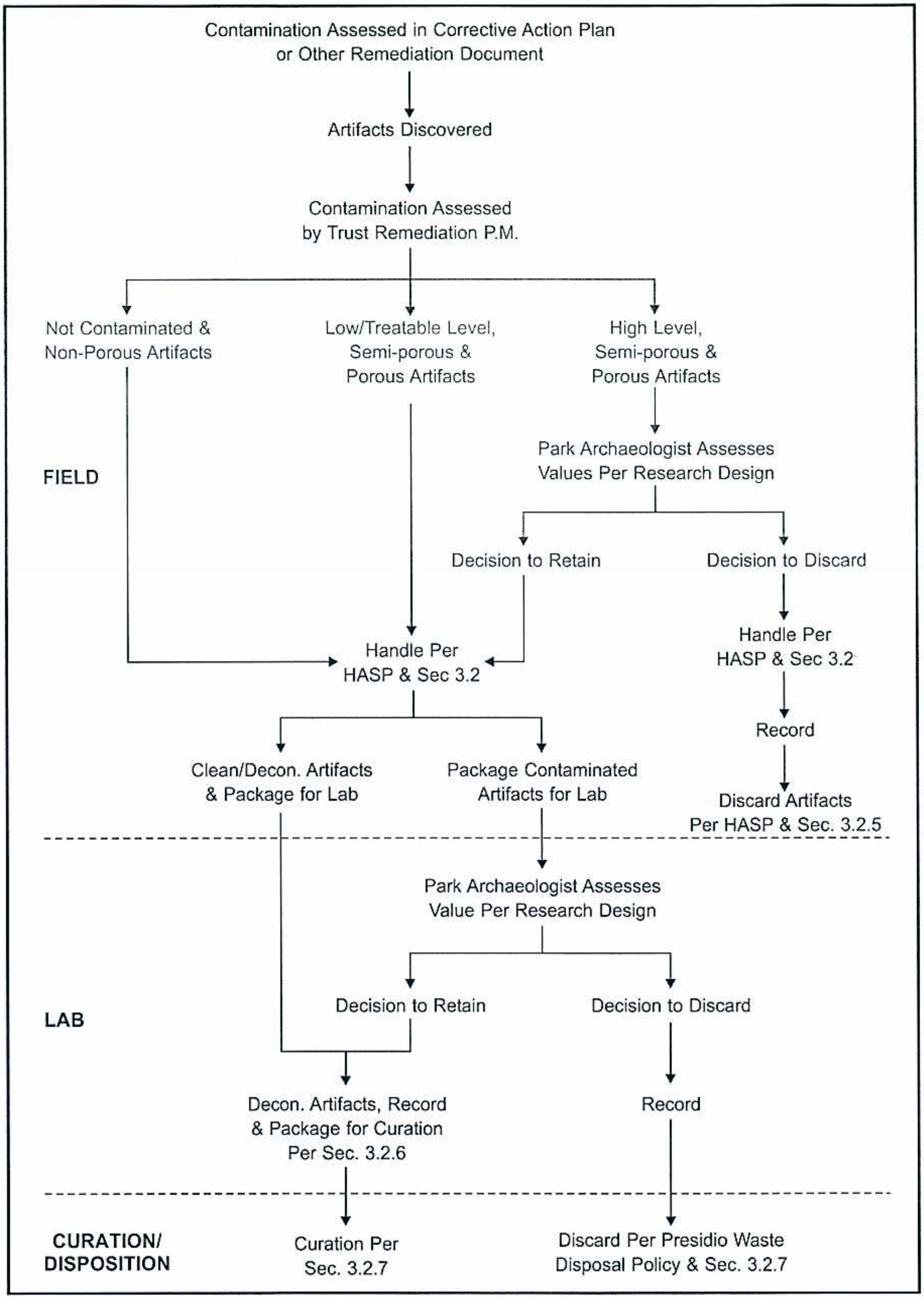


Figure 2. Relative Porosity of Archaeological Remains

	RELATIVE POROSITY		
	Porous	*Semi-porous*	*Non-porous*
ORGANIC REMAINS			
Bone	X		
Leather	X		
Nut/seed	X		
Textile/fabric	X		
Wood/basketry/charcoal	X		
Antler/horn		X	
Ivory		X	
Shell		X	
INORGANIC REMAINS			
Earthenware	X		
Brick (adobe)	X		
Brick (low fired)		X	
Brick (high fired)			X
Ferrous metals			X
Non-ferrous metals			X
Glass			X
Porcelain			X
Stone			X
Stoneware			X

Figure 3. Handling Requirements for Archaeological Material by Work Phase

	Discovery/Field	Processing/Lab	Curation
Porous (e.g., bone[1], fabric)	Handle in accordance with HASP procedures and section 3.2 above; remove excess soil; place in plastic or paper bag or other container to protect structural integrity; if potentially contaminated, label per section 3.2.1 above; transport to lab.	Determine if residual contamination exists; handle in well ventilated environment in accordance with HASP procedures and section 3.2.6 above; rinse with water if not too fragile or clean by hand; standard conservation methods may be applied to non-contaminated materials; dispose of contaminated byproducts appropriately.	Handle cleaned items in accordance with HASP procedures and section 3.2.7 above; most items may be curated in a collection facility that meets the standards at 36CFR79 although some may warrant special conservation and/or storage measures; some items may retain residual contamination that would justify their discard once adequately documented.
Semi-porous (e.g., shell, low-fired brick)	Handle in accordance with HASP procedures and section 3.2 above until cleaned with water, a mild detergent (e.g., Alconox, Simple Green, etc.), and a brush to decontaminate; place in plastic or paper bag; transport to lab.	Determine if residual contamination exists; handle cleaned items in accordance with HASP procedures and section 3.2.6 above; standard conservation methods may be applied to non-contaminated materials.	Handle cleaned items in accordance with HASP procedures and section 3.2.7 above; curate in a collection facility that meets the standards at 36CFR79.
Non-porous (e.g., porcelain, glass, stone, metal)	Handle in accordance with HASP procedures and section 3.2 above until cleaned with water, a mild detergent (e.g., Alconox, Simple Green, etc.), and a brush to decontaminate; place in plastic or paper bag; transport to lab.	Handle cleaned items in accordance with HASP procedures and section 3.2.6 above; standard conservation methods may be applied.	Handle cleaned items in accordance with HASP procedures and section 3.2.7 above; curate in a collection facility that meets the standards at 36CFR79.

[1] The treatment of human remains is described in section 5.4 of ITC's *Archaeological Protocols*. Potentially contaminated human remains should be handled with disposable gloves. Contaminated or not, all human remains must be handled and stored respectfully while they remain under Presidio Trust control.

APPENDIX E

OXYGEN RELEASING COMPOUND INJECTION, NORTHERN PORTION OF BUILDING 228 REMEDIAL UNIT

CONTENTS

FIGURE

ATTACHMENTS

E1.0 OXYGEN RELEASING COMPOUND INJECTION, NORTHERN PORTION OF BUILDING 228 REMEDIAL UNIT

As recommended in the CAP, an oxygen releasing compound (ORC) will be injected in situ within the northern portion of the Building 228 Remedial Unit (Building 228 RU) to enhance aerobic biodegradation of petroleum hydrocarbon contaminants in: (1) saturated soils and/or groundwater within the smear zone, and (2) groundwater within the radius of influence of the injection area.

This appendix summarizes the evaluation conducted to determine the design basis and assumptions for the estimated quantity and application intervals of oxygen releasing compound that will be applied within the Building 228 RU at the Building 207/231 Corrective Action Plan (CAP) Site. This appendix also compares the oxygen releasing compound application and groundwater monitoring conducted at the Building 637 CAP Site at the Presidio (*EKI, 1999a, 1999b, 2000, 2004*) in order to assess if empirical observations from that site can be incorporated into the design basis for the Building 228 RU.

The following corrective actions for the northern portion of the Building 228 RU will be initiated and conducted prior to excavation as part of pre construction activities at the Site, along with the following corrective action components described in the Work Plan: (1) indoor cap inspection and air/soil vapor sampling within Building 228 (Appendix H); and (2) outdoor Building 228 cap inspection.

E-1.1 Remedial Evaluation For Northern Portion of Building 228 RU

This section describes (1) the evaluation of available site data, (2) potentially applicable remedial options for in situ treatment of petroleum-related COCs identified as exceeding cleanup levels in saturated soil and groundwater, (3) evaluation of Building 637 CAP Site ORC injection data; and (4) the resulting design basis developed for injection of an oxygen releasing compound within the northern portion of the Building 228 RU as described in Section E-2.0.

E-1.2 Evaluation of Existing Data

MACTEC performed an evaluation of available RU-specific data from the CAP for the northern portion of the Building 228 RU that included soil and groundwater grab samples collected prior to preparation of the CAP. Because a groundwater monitoring well is not present within this RU to provide reproducible data on groundwater contamination and conditions, data from the newly installed well, New Well 1, described in Section E-2.0 will be evaluated and the design basis described below will be used to assess if modifications to the ORC injection rate are required. If the data indicates that a lower or higher injection rate is warranted, then this assessment and any recommendations will be provided during one of the weekly stakeholder meetings prior to implementation of ORC injection.

The existing available data indicated the following:

- The northern portion of the Soil RU at this area is co-located with a groundwater RU associated with the former Building 228 USTs (Figure 1-8 of the Work Plan). The areas of soil containing COCs above cleanup levels are located between historic Building 228 and the historic wall in the vicinity of the excavation area associated with the former 228 USTs.

- The northern portion of the Soil RU is located in unsaturated and saturated soil between 1 to 11 feet bgs, and comprises approximately 120 cubic yards of soil. The COCs that were detected in soil at concentrations above cleanup levels in the northern portion of the Soil RU include: TPH as gasoline, diesel, and fuel oil (TPHg, TPHd, TPHfo); ethylbenzene, and xylenes. The COCs that were detected in groundwater at concentrations above cleanup levels in the northern portion of the Soil RU include: TPHg, TPHd, TPHfo; ethylbenzene, and xylenes; 1,2-dichlorobenzene (1,2-DCB); and nickel.

E-1.3 Evaluation of Remedial Options Based on Existing Data

The remedial options MACTEC considered for the northern portion of the Building 228 RU (Site) are proven remedial techniques for the remediation of petroleum hydrocarbon compounds, in particular total petroleum hydrocarbons in the gasoline range. The primary remedial options considered were Insitu Bioremediation via introduction of dissolved oxygen and Insitu Chemical Oxidation (ISCO) via injection of a chemical oxidant.

Insitu bioremediation typically involves the introduction of oxygen (and other deficient nutrients) to foster microbial activity. Native bacteria in the soil and groundwater will metabolize the petroleum hydrocarbon compounds; the biodegradation of the petroleum hydrocarbons occurs most favorably under aerobic (oxygen-rich) conditions.

ISCO involves the injection of a chemical oxidant within the area of contamination. On contact with the hydrocarbon compound, the chemical oxidant will react with the hydrocarbon compound to produce inert compounds. Typical chemical oxidant compounds used in remediation include ozone, hydrogen peroxide, potassium permanganate, and sodium persulfate.

In evaluating the remedial options, the following Site constraints and requirements were identified:

- Restricted access to area of contamination (treatment area).
- Preservation of the Historic Retaining Wall between Buildings 228 and 231.
- Sensitivity of treatment area to introduction of remedial compound residues and biota.
- Shallow groundwater and relatively thin aquifer zones (about 10 feet thick).
- Other sources of carbon (Bay Mud).
- Low maintenance remedial option.

The following discussion provides a brief description of the remedial options considered for the Site and their potential advantages and disadvantages.

Ozone sparging would involve “bubbling” a gas-phase oxidant through the area of impact and is an effective means to remediate the Site. Chemical oxidation using ozone is rapid due to its reactivity, and as such, ozone has short lifetime (up to 60 minutes) in the subsurface. Typical ozone treatment components would include construction of an ozone generating plant, the installation of sparge wells, and trenching of supply lines. Further effort would be required to supply power to equipment and provide field operations and maintenance to equipment. Infrastructure requirements for this option are high. While remediation via ozone sparging would potentially be very effective, this option would have high maintenance associated with it. As the injection of ozone typically occurs several feet below the area of

impact, the relatively thin aquifer beds would restrict the zone of influence achievable via sparging necessitating a closer on center spacing of sparge points. Further, it should be anticipated that efficient utility of ozone will not be achieved due to a strong demand from the natural organic content of the Bay Mud (and other oxygen seeking substances such as reduced metal compounds). Furthermore, the heavier, more weathered, and less volatile nature of the petroleum hydrocarbon compounds will limit the effectiveness of ozone sparging, whose success depends on volatilization and oxidation of compounds.

Injection of hydrogen peroxide involves providing the chemical oxidant in a liquid phase, via dedicated injection wells or one-time injection points (boreholes). As with ozone, hydrogen peroxide reacts with hydrocarbon compounds via contact to decompose the hydrocarbon; however, hydrogen peroxide is not as reactive as ozone and has a longer life time (up to days) in the subsurface. To achieve significant distribution of the hydrogen peroxide in the subsurface, the oxidant is usually injected under pressure. As such for safety precautions, the hydrogen peroxide solution is typically less than 15 percent by weight. Injection of hydrogen peroxide could be achieved using a conventional Geoprobe rig with an injection pump and a storage tank, field crews would be required to wear appropriate safety equipment. As with ozone sparging, a high density of hydrogen peroxide injection points would be required to ensure adequate coverage because of site specific geologic setting.

In situ bioremediation can be stimulated by injecting a slurry of an Oxygen Release Compound (ORC) into the treatment area. The ORC slurry when injected into the subsurface hardens to mortar that slowly dissolves over time releasing oxygen to the groundwater. ORC typically dissolves over a period of 9 to 12 months, and provides a steady source of dissolved oxygen to the subsurface to enhance bioremediation during and subsequent to this time period for up to 6 months. The dissolved oxygen is distributed by the flow of groundwater, as such; the dissolved oxygen will follow a similar flowpath as the dissolved hydrocarbons. The ORC is typically placed using a conventional Geoprobe rig with and injection pump and mixing tank. The ORC slurry and mixture is benign and its injection does not require the safety precautions associated with the ISCO method.

Given the Site constraints and the site-specific geologic setting, insitu bioremediation provides the best remedial option for the area of contamination in and around Building 228. The ORC-enhanced bioremediation would potentially be in effect for up to 18 months after injection due to the lasting nature of ORC slurry; in addition, there are no maintenance requirements following placement. Using a conventional Geoprobe rig, rows of ORC-filled boreholes can be placed around Building 228 without significant disturbance to existing structures. The non-toxic nature of the ORC compound also poses no threat to future development plans of the area.

E-1.4 Evaluation of Building 637 CAP Site Oxygen Releasing Compound Data

In 1999 and 2000, oxygen releasing compound was applied to soil to treat residual petroleum hydrocarbon contamination in soil at the Building 637 CAP Site (*EKI, 1999a, 1999b, 2000, 2004)*. The site conditions and application quantities used at the Building 637 CAP Site were reviewed to provide supporting data to assist in the evaluation and development of the proposed application quantity of oxygen releasing compound at the Building 228 RU at the Building 207/231 CAP Site.

E-1.4.1 Comparison of Site Conditions at Building 637 CAP Site

The Building 637 CAP Site and Building 228 RU are similar in terms of (1) soil types consisting of fill underlain by silty sands and Bay Mud, (2) depth to groundwater, and (3) the type and distribution of petroleum contamination, as described below.

Comparison of Soil Types and Depth to Groundwater: Soils at the Building 637 CAP Site consist of fill material and naturally occurring interbedded fine-grained estuarine and sand deposits. Fill material extends 8 to 9 feet below ground surface (bgs). Monitoring wells are installed in two distinct water bearing zones: A1 and A2. Groundwater is typically encountered from 3 to 9 feet bgs in the A1 zone and 4 to 7 feet bgs in the A2 zone.

The Building 228 RU is underlain by fill and native deposits consisting of clayey or silty sand, Bay Mud, and silt. The Building 228 RU is underlain by fill and native deposits consisting of clayey or silty sand, Bay Mud, and silt. The fill and shallow sand extend to a depth of approximately 12 feet. Groundwater is typically encountered at a depth of approximately 10 feet bgs in the shallow zone. Intermediate groundwater is separated from shallow groundwater by the Bay Mud, which extends to a depth of approximately 15 feet bgs.

Comparison of Nature and Extent of COCs: Soil and groundwater at both sites has been impacted by leaking petroleum fuel tanks and/or fuel distribution systems and share the following petroleum-related chemicals of concern (COCs): TPHg; TPHd, TPHfo, and ethylbenzene (Building 228) or benzene (Building 637). The range of concentrations of petroleum-related COCs in soil and groundwater are similar at both sites.

E-1.4.2 Evaluation of Oxygen Releasing Compound and Application Quantities at Building 637 CAP Site

Petroleum-impacted soil was excavated by the Trust at six areas (Areas A, B, C, D, E, and F) at the Building 637 CAP Site (*EKI, 1999a, 1999b, 2000, 2004)*. Oxygen releasing compound was applied to excavations at Areas C and F during backfilling and was applied via injection at an area located between two previous excavations conducted by the Army (referred to as the “area between the Army excavations”) (see Attachment, Extent of Excavations and ORC Treatment Area Maps).

The specific oxygen releasing compound used at Building 637 CAP Site was Oxygen Release Compound (ORC) manufactured by Regenesis Technical Support (Regenesis). ORC is a magnesium peroxide based compound. In contrast, ORC Advanced™ is proposed for use at the Building 228 RU, which is a calcium peroxide based compound. Regenesis modified and improved its oxygen releasing compound since the Building 637 CAP Site work was conducted; therefore it is not possible to provide a direct comparison between ORC application quantities between these two sites.

At the Building 637 CAP Site, the estimated mass of hydrocarbons present in residual soil was determined for soil at Area F and the area between the Army excavations (*EKI, 1999b)*. Based on site-specific soil data and COC concentrations collected from the Building 637 CAP Site, the Trust’s contractor, Erler and Kalinowski, Inc. (EKI), estimated 21,800 lbs of hydrocarbons (1,800 lbs TPHg in Area F and 20,000 TPHd in the area between the Army excavations) were present in the smear zone soils. Based on site-specific groundwater data from the Building 637 CAP Site (and multiplying by an additional demand factor of 7 to 10 as suggested by Regenesis), EKI estimated approximately 7 to 10 pounds of hydrocarbons were present in groundwater. However, due to the disparity in the mass

estimates using soil and groundwater data, EKI used the ORC application quantity that Regenesis recommended. Approximately 1,320 pounds (lbs) of ORC (0.3 percent ORC by weight of treated soil) was applied to the excavations at Areas C and F. Similarly, the quantity of ORC injected in the area between the Army excavations was based on Regenesis' recommendations. Approximately 2,690 lbs of ORC was applied via injection.

For the proposed corrective action at the Building 228 RU, Regenesis recommended ORC Advanced ™ be applied at 0.4 percent ORC Advanced ™ by weight of impacted soil. This recommendation is based on experience that Bay Mud generally exhibits a relatively high oxygen demand due to the high level of inorganic carbon and non-petroleum organic materials in the soil.

Although the sites are similar in terms of (1) soil types, (2) depth to groundwater, and (3) the type and distribution of petroleum contamination, Regenesis recommended more than twice as much oxygen by weight of soil at the Building 228 RU (0.00068 pounds) compared to the recommendation they provided at the Building 637 CAP Site (0.0003 pounds), as follows:

- For every pound of saturated soil to be treated at the Building 228 RU, 0.004 pounds of ORC Advanced ™ times 0.17 pounds of oxygen released by ORC Advanced ™ yields about 0.00068 pounds of oxygen.

- For every pound of saturated soil treated at the Building 637 CAP Site, 0.003 pounds of ORC times 0.1 pounds of oxygen released by ORC yields about 0.0003 pounds of oxygen.

The additional oxygen dosage recommended by Regenesis at the Building 228 RU is to accommodate for the expected higher oxygen demand from organic materials present in the Bay Mud underlying the site. Based on Regenesis' experience in the several years since the ORC design was prepared for the Building 637 CAP Site, they now recommend more than twice the oxygen dosage to meet the high oxygen demand present in a Bay Mud environment such as is present within the Building 228 RU.

E-1.4.3 Evaluation of Groundwater Monitoring Data at Building 637 CAP Site

The results of groundwater monitoring at the Building 637 CAP Site indicated that source removal and ORC application in excavations and by injection was effective in reducing concentrations of petroleum-related COCs in groundwater at the site to levels below applicable cleanup levels. ORC was applied within the excavated areas prior to backfilling and via injection points in a separate area between excavations where soil was not excavated. Three monitoring wells located immediately downgradient of the ORC application area were monitored prior to the ORC injection to establish a baseline for evaluating the effectiveness of the source removal and ORC application. Baseline monitoring was performed four months after placement of the ORC in the excavation, and 20 days prior to injection. Quarterly sampling was conducted for two years after the ORC was applied. Based on groundwater monitoring results, concentrations of COCs in groundwater decreased or remained below cleanup levels (see Attachment, Groundwater Monitoring Results at Building 637 CAP Site).

Groundwater monitoring will be conducted downgradient of the Building 228 RU at New Well 1 at least one month prior to placement of the oxygen releasing compound, and quarterly thereafter. As summarized in Table 2-1 of the Work Plan, the new monitoring well that will be installed prior to injection will be monitored for water levels, petroleum-related COCs, arsenic, aluminum, iron, manganese, and the redox parameters dissolved oxygen and oxidation reduction potential, and field

parameters for four quarters, then semiannually. In addition, as described in Table 2-1 of the Work Plan, the existing monitoring wells and five additional new wells will be monitored quarterly for one year then annually for water levels, arsenic, redox parameters, and field parameters. This monitoring approach will allow for evaluation of the effectiveness of the ORC Advanced™ in reducing contaminant concentrations in groundwater. Although Regenesis also includes a general recommendation in their *Letter Proposal* (see Attachment) to monitor groundwater for the additional parameters of biological oxygen demand (BOD) and chemical oxygen demand (COD), these data will not be collected because the monitoring parameters listed above will provide a comprehensive data set to design and monitor the effectiveness of oxygen releasing compound application at the Building 228 RU as described in Section E-2.0.

E-1.4.4 Summary of Data Comparison Between Building 637 CAP Site and 207/231 Site

The following conclusions resulting from (1) the evaluation and comparison of data from the two sites; and (2) Regenesis' experience and recommendations regarding the two sites, were considered in the development of the proposed oxygen releasing compound design for the Building 228 RU presented in Section E-2.0:

- The quantity of oxygen releasing compound to be applied via injection as recommended by Regenesis can be effective at reducing petroleum-related contamination from residual concentrations of petroleum-related COCs in saturated soils and groundwater. Regenesis' calculations are based on the estimated weight of soil impacted by petroleum hydrocarbons and the presence of Bay Mud, and do not specifically consider the concentrations of contaminants in the soil. The Bay Mud has a high oxygen demand compared to other types of soil.

- The theoretical mass of residual petroleum-related contamination in soil to be treated greatly over-estimates the quantity of oxygen releasing compound needed to treat the soil. Regenesis' experience in the Bay Area is an important overriding consideration in determining the oxygen releasing compound quantity.

- Application of ORC Advanced™ via injection is anticipated to be effective and is proposed for treatment of residual petroleum contamination. The application of ORC via injection at the Building 637 CAP Site is likely to have contributed to reducing petroleum-related COC concentrations in groundwater below cleanup levels, but can not be wholly assessed on its own merits because it was implemented in conjunction with application of ORC in excavations prior to backfilling, as well as source removal by excavation.

- The estimated oxygen releasing compound application quantities that are based on existing data should be reevaluated prior to application if the groundwater data from the new well, New Well 1, warrant a higher dosage than that currently recommended. If the data indicates a higher dosage is warranted, then it will be presented in one of the weekly stakeholder meetings for approval prior to implementation.

E-2.0 DESIGN BASIS FOR PROPOSED OXYGEN RELEASING COMPOUND INJECTION AT BUILDING 228 RU

Based on the evaluation of data and remedial options presented in Section E-1.0, MACTEC proposed to treat residual petroleum contamination above cleanup levels in situ in saturated soils and groundwater via injection of an in-situ oxygen releasing compound slurry within the northern portion of the Building 228 RU between the northern wall of historic Building 228 and the historic wall using direct push technology. MACTEC will contract with and oversee a direct push injection subcontractor, who will inject ORC through overlapping direct push injection points.

E-2.1 New Monitoring Well Installation, Development, and Sampling

In order to provide an adjacent performance monitoring location downgradient of the northern portion of the Building 228 RU, T&R will install, develop, survey, and sample the new downgradient monitoring well (New Well 1) at least one month prior to in situ injection of an oxygen releasing compound (see Figure 1-8 of the Work Plan for well location). Monitoring will provide baseline data for comparison with post ORC injection analytical data.

T&R will install and develop the new well following the guidelines set forth in the Presidio-Wide QAPP; [*Tetra Tech, 2001*] SOP No. 004 and 005 specifically; Appendix F); specifically, it will be installed using a hollow-stem auger rig, constructed with 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing, and a 2-inch diameter 0.010 slotted casing with 2/12 sand, screened from approximately 5 to 20 feet bgs.

The location and elevation will be surveyed by a licensed land surveyor to within ±0.01 foot accuracy in accordance with survey requirements in Section 3.1.8 of the Work Plan. This well will be sampled as part of the Presidio-wide quarterly groundwater monitoring and sampling schedule as summarized in Table 2-1 of the Work Plan; the first round of sampling will be performed separately if it is not installed in time for the regularly scheduled sampling event.

E-2.2 Design Basis and Proposed ORC Injection Methodology

This section describes the site-specific data and calculations provided by Regenesis, the oxygen releasing compound manufacturer for the Oxygen Release Compound Advanced ™ (ORC Advanced™) compound selected for application within the northern portion of the Building 228 RU, along with the remedial design assumptions that were used to calculate application rates.

E-2.2.1 Design Basis for Proposed ORC Injection

ORC Advanced ™ is proposed for injection within the Building 228 RU at the quantity recommended by Regenesis in their *Letter Proposal*, dated January 25, 2007 (see Attachment). The proposed application design is labeled in the proposal as “preliminary” in order to allow for flexibility in adapting the design based on additional groundwater monitoring data from New Well 1 that will be collected between the date of publication of this Work Plan, and field implementation of ORC injection. If the data indicates a higher dosage is warranted, then it will be presented in one of the weekly stakeholder meetings for approval prior to implementation.

The on-center spacing between injection points in each row of injection points is recommended to be 10 foot (i.e., in the east west direction) and that between rows is recommended to be 5 foot (i.e., in the north south direction) for an area of influence of each injection point of 50 square feet.

For the proposed corrective action at the Building 228 RU, Regenesis recommended ORC Advanced™ be applied at 0.4 percent ORC Advanced™ by weight of impacted soil.

Based on an average estimated weight of 110 pounds per cubic feet for typical site soils (that will be reassessed based on site-specific data to be collected from New Well 1) and an area of influence of 50 square feet for each injection point, the volume of impacted soil is estimated to be 50 cubic feet per foot of each injection point for a weight of impacted soil of 5,500 pounds per foot of injection point. At an application rate of 0.4 percent by weight of impacted soil, the weight of ORC Advanced™ per foot of injection point is estimated to be 22 pounds per foot.

Also note that this estimate of 22 pounds per foot is higher than the value of 6.1 pounds of ORC per foot (using site-specific petroleum related COC data) estimated by the Regenesis author in the December 2006 letter. In addition, the weight of soil was estimated by assuming an average soil density of 1.76 grams per cubic centimeter; or 110 pounds per cubic feet (lbs/ft3) times the volume of residual soil occupied by petroleum hydrocarbons. Regenesis based their recommended application quantity in part on the above estimated “in place” weight or density of the soil within the RU-A excavation of approximately 110 pounds per cubic foot, which is approximately 1.5 tons per cubic yard. Based on data from the excavation and offsite disposal of petroleum hydrocarbon-impacted soil south of RUs-A at the Building 1065 CAP Site conducted as part of the 2003-2004 Phase I Interim Action (IA), the average weight of excavated soil hauled offsite is estimated to range from approximately 1.7 to 1.8 tons per cubic yard (*MACTEC*, *2004b*). If the higher estimated weight of soil based on the IA data was used in place of the average weight of soil assumed by Regenesis’, the application quantity would be somewhat higher. However, based on Regenesis’ experience, the application quantity based on the average weight of soil (and type of soil as Bay Mud) will provide significant oxygenation to enhance biodegradation that is sufficiently conservative for the site conditions.

However, the data collected from the pre-construction groundwater monitoring from New Well 1 will be assessed to verify if the conditions warrant a lower or higher application rate. This assessment will be provided to the stakeholders for review during one of the weekly stakeholder meetings prior to implementation of ORC Advanced™ injection.

E-2.2.2 ORC Injection Application Procedures

MACTEC will subcontract with a driller who will drill the injection points with a direct push drill rig. Based on these assumptions, in order to achieve a radius of influence (ROI) of approximately 5 feet and provide in-situ treatment throughout the RU, twelve injection points will be drilled in three rows of four points each, with the rows spaced approximately five feet apart as shown on Figure E-1, and the rough sketch included in Regenesis’ proposal (see Attachment). Each injection point will be drilled throughout the saturated zone of detectable petroleum-related COCs in soil and/or groundwater (anticipated to be approximately 6 to 20 feet bgs). The slurry will be mixed in a ratio of 30 to 40 percent solids to clean water, and will be injected at the design rate noted above.

Approximately 22 pounds per foot of ORC is proposed for each injection point (see Section E-2.2.1 for injection point spacing). The vertical application interval within each of the twelve injection points is proposed from approximately ten to twenty feet bgs based on existing data, with the intention of distributing oxygen releasing compound throughout the saturated zone. However, the proposed vertical injection interval will be reassessed if data collected during installation and sampling of downgradient New Well 1 provides more specificity on the extent of the saturated zone in this area.

The ORC Advanced™ slurry will be injected within the northern portion of the Building 228 RU between the northern edge of historic Building 228 and the historic wall using direct push technology to treat residual petroleum contamination above cleanup levels in saturated soils and groundwater. Based on available data, in order to achieve a zone of influence approximately five feet in the south direction and ten feet in the east-west direction and provide in-situ treatment throughout the RU, the slurry will be injected on a grid of twelve injection points in three rows of four points each, with the rows spaced approximately five feet apart as shown on Figure E-1. The slurry will be mixed in a ratio of 30 to 40 percent solids to clean water, and will be injected at a rate of approximately six pounds per foot at each injection point. The vertical application interval within each of the twelve injection points will be from approximately six to twenty feet bgs, spanning the saturated zone of petroleum-related contamination.

The oxygen releasing compound slurry will be delivered to the subsurface under variable pressure (depending on the formation variability in the fourteen-foot vertical interval) using DPT methods, in a manner consistent with the manufacturer's recommended application guidelines presented in Attachments.

The calculated volume of oxygen releasing compound should introduce sufficient oxygen into the surrounding sub-surface soils to reverse the local reducing conditions that have been observed at the Site and stimulate aerobic hydrocarbon degrading bacteria to reproduce and break down residual hydrocarbons present in saturated soils and groundwater. As described above, a new downgradient monitoring well will be installed in advance of injection, and will be used to monitor the effectiveness of the oxygen releasing compound in reducing concentrations of COCs below cleanup levels, and performance monitoring and in situ confirmation sampling will be performed as described below.

E-2.3 Post-Injection Performance Monitoring

The new well, New Well 1, to be installed downgradient of the ORC™ treatment zone will be sampled once prior to ORC injection and following ORC injection in accordance with the schedule presented in Table 2-1 of the Revised Work Plan. The collected samples will be tested for:

1. 228 RU specific groundwater analytes (see Table 2-1); and
2. arsenic and aluminum

The samples from the well will also be tested for the following field parameters and analytes presented in Table 2-1 of the Work Plan:

1. field redox parameters (oxidation reduction potential [ORP]), dissolved oxygen [DO]); and
2. dissolved manganese and iron

Following injection, the ability of the ORC in creating conditions favorable for biodegradation of petroleum hydrocarbon compounds will be assed through the monitoring conducted to:

1. verify that the ORP and DO levels are increasing in the new well relative to pre-injection conditions.
2. verify that Fe(III) concentrations are increasing through the reduction in dissolved iron concentrations (as Fe (III) is insoluble relative to Fe(II)) relative to pre-injection conditions.
3. verify that manganese concentrations are increasing through the increase in dissolved manganese concentrations (as a result of oxidation from Mn (2+) to the insoluble Mn(4+)) relative to pre-injection conditions.

4. verify that arsenite concentrations are reducing through the reduction in dissolved arsenic concentrations (as a result of the conversion of arsenite to the more oxidized and insoluble form of arsenate) relative to pre-injection conditions.

Based on the data and remedial option evaluation presented in Section E-1, and MACTEC's experience with sites with similar geologic settings, it is expected that the oxygen releasing compound will begin releasing oxygen immediately upon introduction into the water column and to continue to release oxygen for a period of approximately 18 months. Two years after the oxygen release compound has been injected, the Trust will conduct in situ direct-push technology (DPT) soil confirmation sampling within and outside of the footprint of the RU considering the technical constraints of access due to the presence of existing buildings or other structural constraints. Details regarding the confirmation sampling will be described in an appendix to the Construction Completion Report based on the results of post-construction groundwater monitoring that assesses the effectiveness of oxygen release compound injection in reducing petroleum-related COCs within the saturated zone.

Additional application of in-situ oxygen release compound via in-situ injection may be considered if results of groundwater monitoring and confirmation sampling indicate concentrations of COCs exceeds cleanup levels approximately 18 months after the oxygen releasing compound is applied. MACTEC will evaluate the effectiveness of the oxygen releasing compound and present the evaluation in a technical memorandum (as described in Section 5.0 of the Work Plan, Reporting and Corrective Action Documentation) that summarizes water quality data, and recommendations for further oxygen releasing compound application, if needed. The Trust will present data to stakeholders on the effectiveness of treatment as well as recommendation for further treatment (possible injection of additional oxygen releasing compound), if necessary.

E-3.0 REFERENCES

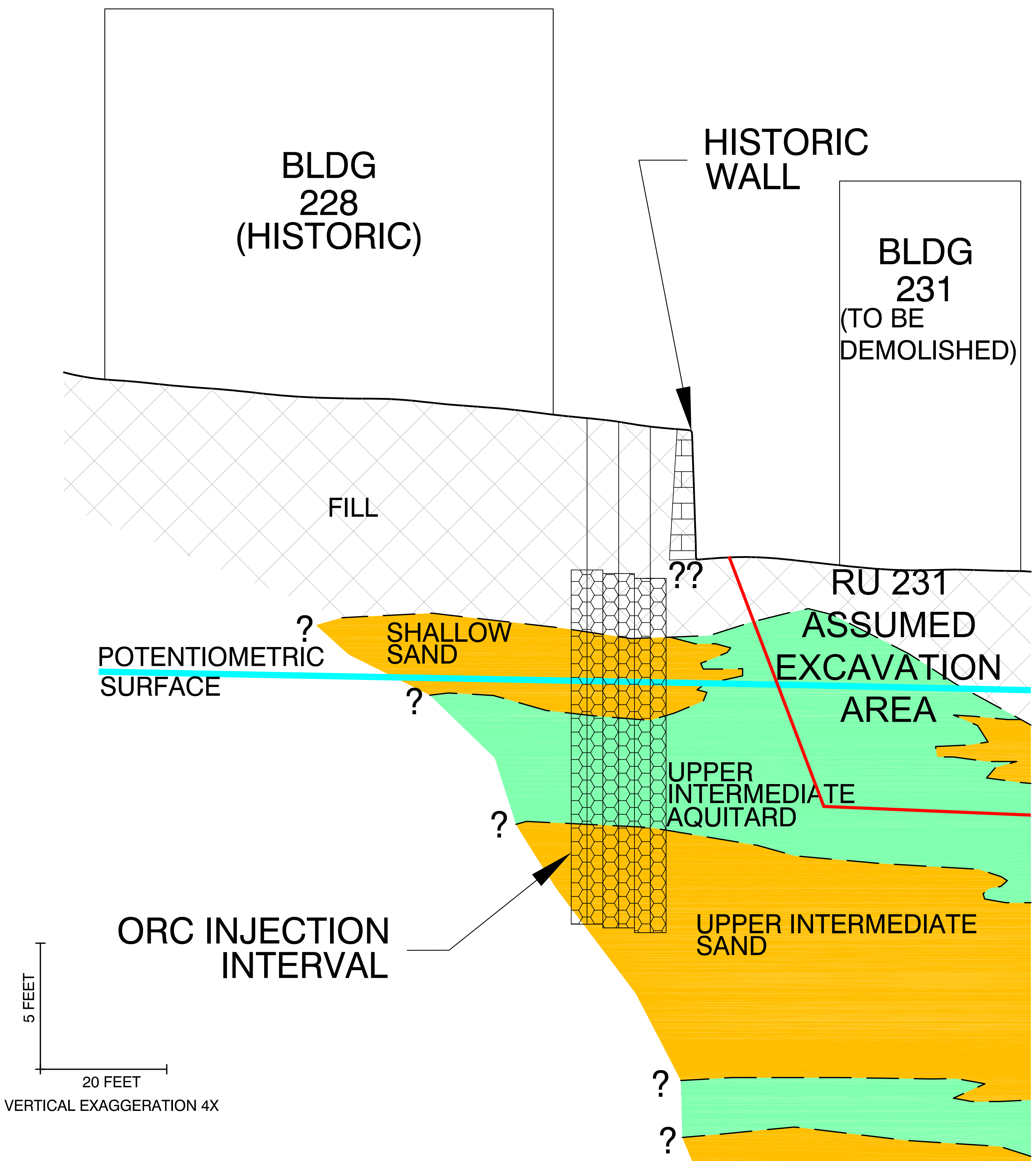
Erler & Kalinowski, Inc. (EKI), 1999a. *Final Corrective Action Plan Building 637 Area, Presidio of San Francisco, California.* August.

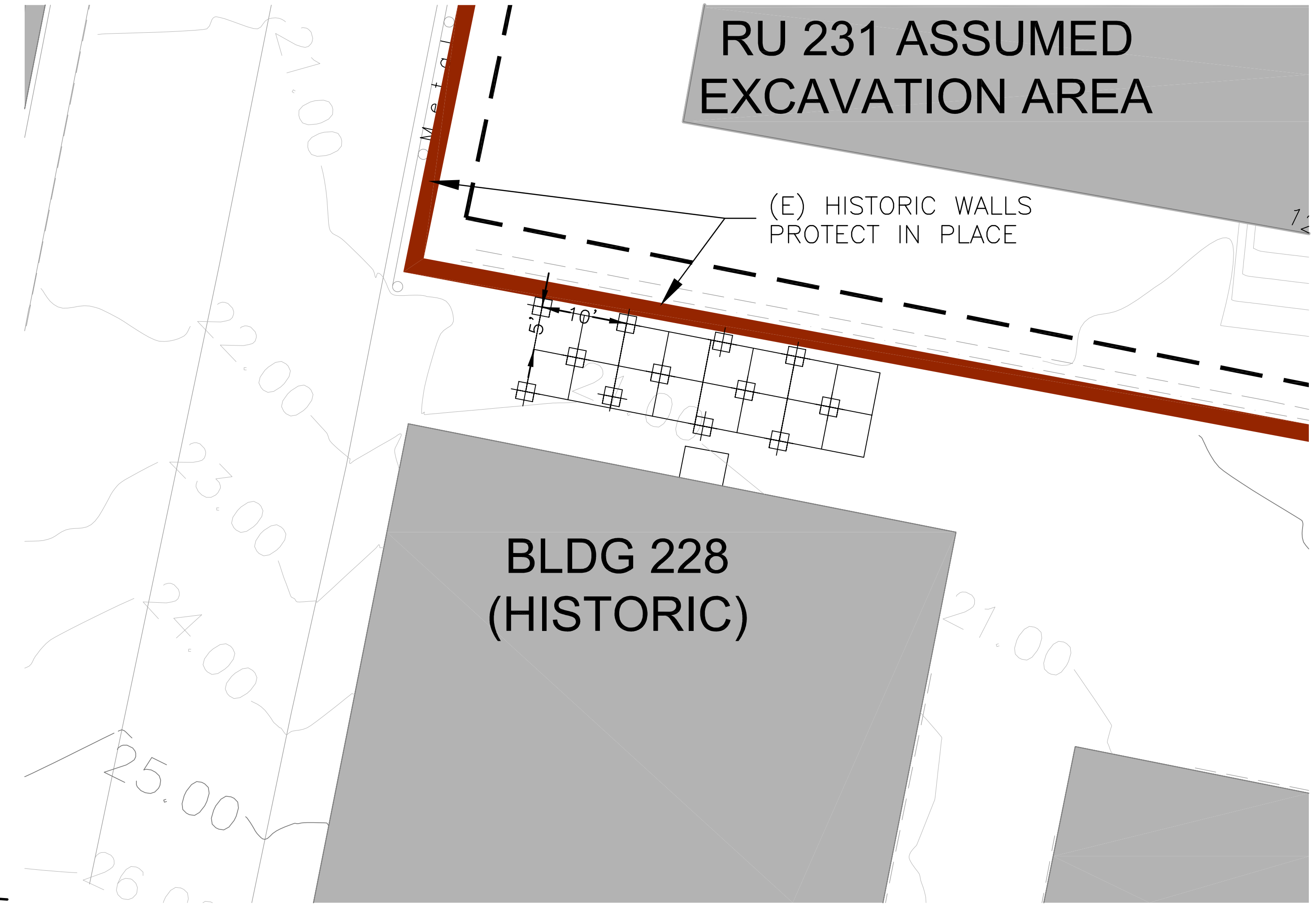
_____, 1999b. *Corrective Action Plan Building 637 Area Work Plan, Presidio of San Francisco, California.* August.

_____, 2000. *Excavation Report for the Building 637 Area, Presidio of San Francisco, California.* June 22.

_____, 2004. *Completion Report for the Building 637 Area, Presidio of San Francisco, California.* March 31.

FIGURES





NOTES:

1. OXYGEN RELEASE COMPOUND (ORC) WILL BE INJECTED BY A TYPICAL 4-INCH DIAMETER DPT BORING EXTENDING FROM THE GROUND SURFACE TO 20' BELOW THE GROUND SURFACE (BGS).

2. ORC WILL BE INJECTED FROM 6' TO 20' BGS AND HAVE A 5' LATERAL RADIUS OF INFLUENCE.

3.POTENTIOMETRIC SURFACE WAS GENERATED FROM DATA SHOWN IN THE SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006(TREADWELL AND ROLLO, OCTOBER 2006).

LEGEND

ORC INJECTION POINT

NOVEMBER 28, 2005 SHALLOW SAND POTENTIOMETRIC SURFACE (TREADWELL AND ROLLO, OCTOBER 2006)

PROFILE OF ASSUMED EXCAVATION AREA

ASSUMED EXCAVATION AREA

N

10 0 10 20

SCALE IN FEET

4084075106060.DWG 1.0
20071019.1104

MACTEC

PROPOSED OXYGEN RELEASE COMPOUND
INJECTION PLAN
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE: E-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

APPENDIX E

ATTACHMENTS

REVIEWED BY: RR

REGENESIS

December 4, 2006 **Proposal No. 1JB07201**

Margaret Stemper
MACTEC
189 North Main Street
South Deerfield, MA 01373
E-mail: mlstemper@mactec.com

Subject: Application of ORC *Advanced* (Advanced Formula Oxygen Release Compound) to Accelerate the Natural Attenuation of Contaminants of Concern (COCs) at the Presidio Building 228 Site in San Francisco, California

Dear Ms. Stemper:

Thank you for your interest in Regenesis and our Advanced formula Oxygen Release Compound (ORC *Advanced*™) product. We have reviewed the information that you provided for the above-referenced site. In the following sections of this proposal, we will discuss: the use of ORC *Advanced*, design and cost information, delivery of ORC *Advanced* to the subsurface, a recommended groundwater monitoring program, and the performance goals for this particular project. In addition, this proposal should be considered preliminary because some assumptions were made regarding the current biogeochemical conditions of the aquifer and the extent of the contaminant plume requiring treatment. We look forward to working with you on developing a site-specific strategy that will help meet your objectives for the site.

Use of Advanced formula Oxygen Release Compound (ORC *Advanced*™) to Accelerate Bioremediation

Advanced formula Oxygen Release Compound (ORC *Advanced*) is a patented formulation of phosphate-intercalated calcium oxyhydroxide that is a timed-released source of oxygen. ORC *Advanced* releases oxygen in the dissolved-phase when it is hydrated. Numerous studies have shown that the lack of oxygen can limit the ability of naturally occurring microorganisms (aerobes) to degrade certain compounds. ORC *Advanced* provides terminal electron acceptors to support the oxidative biodegradation of many types of aerobically degradable compounds including but not limited to: petroleum-based hydrocarbons (e.g. Toluene) and chlorinated hydrocarbons (e.g. Vinyl Chloride). ORC *Advanced* is manufactured as a fine powder that can be installed in the subsurface in the following ways: (1) mixed with water to form a slurry that can be injected into both the saturated and unsaturated zones, and (2) added as a soil amendment to the backfill material used in excavation applications. The use of oxygen sources such as ORC *Advanced* is recognized as a sensible strategy for engineering accelerated bioattenuation at project sites contaminated with aerobically degradable compounds.

Checked MS

Approved

Preliminary Design and Cost Information for Full Scale Remediation

Based on the provided data and our earlier conversations with you, Regenesis understands that the treatment approach at the subject site will consist of a barrier-based design approach upgradient of the historic wall north of building 228. This treatment strategy should significantly reduce the risk associated with the downgradient migration of COCs towards the historic wall and remediate the petroleum impacted soil upgradient of the historic wall. The design specifications for this treatment approach are found in a subsequent table.

Data and Assumptions Used to Design this ORC *Advanced*™ Project

The following data was used to determine the quantity of ORC *Advanced* needed for this site-specific project:

- Estimated plume area requiring treatment: The ORC *Advanced* barrier design presented is designed to significantly reduce contaminant migration north towards the historic wall and treat petroleum impacted soils extending north from building 228 to the historic wall.

- Representative contaminant concentration: [TPH] = 9.60 mg/L, [Toluene] = 0.0014 mg/L, [Ethylbenzene] = 0.085 mg/L, [Xylenes] = 0.094 mg/L

- Contaminated saturated zone thickness requiring treatment: 14 feet (6 to 20 feet bgs[1])

- Estimated groundwater velocity: up to 50.2 feet/year (**Please note that groundwater velocity controls the contaminant flux into the treatment zone. This flux should be considered when specifying ORC *Advanced* dosing requirements.)**

- Current groundwater geochemistry: assumed to be generally **[anaerobic]** with dissolved oxygen (DO) = 0.7 mg/L, nitrate = 0.05 mg/L, ferrous iron = 8 mg/L, and oxidation reduction potential (ORP) = Unknown mV

The design specifications and costs cited in the table below represent a preliminary design for an accelerated bioremediation project. The final design for this project may need to be adjusted as detailed design and regulatory oversight issues are finalized. For example, the following design variables may need to be adjusted prior to the implementation:

- Treatment areas may need to be increased or decreased depending on the overall site remediation strategy.
- The final delivery locations may need to be adjusted to account for site features such as underground utilities and other site structures.

The Regenesis Technical Services Group is available to assist in the selection of an appropriate final design.

---

[1]bgs = below ground surface

ORC Advanced Barrier Treatment	
Design Feature	**Specification**
Saturated thickness requiring treatment	14 feet
Treatment area	40 foot long barrier
Delivery point spacing and configuration	10 ft-on-center within rows, 5 ft between rows 3 rows of 4 points; 12 total points
ORC Advanced dose rate in lbs/vertical foot of injection	6.1 lbs/foot, (85 lbs/point)
ORC Advanced material requirement	12 pts. x 14 feet x 6.1 lbs/ft = 1,025 lbs
ORC Advanced material cost at $8.75/lb	$8,968.75 plus shipping and applicable sales tax

Total ORC *Advanced*™ Project Cost

The total cost of an ORC *Advanced*-accelerated bioremediation project can be estimated using the following items:

- ORC *Advanced*™ material, shipping fees, and sales tax
- Fieldwork costs associated with the installation of ORC *Advanced* (Customers are responsible for selecting the drilling subcontractor that will be used for the project.)
- Groundwater monitoring well construction (If additional monitoring wells are needed to properly monitor the performance of the project.)
- All fieldwork and laboratory analysis associated with periodic groundwater monitoring events
- Consultant oversight and report generation

The costs presented in this proposal are for ORC *Advanced* material costs for a one-time application only. The need to re-apply ORC *Advanced* depends on your plume management strategy, site-specific biodegradation performance, and the ultimate remediation goals for the site as well as other technical or regulatory considerations. For barrier-based designs, re-applications will be necessary every year as long as there is a need to prevent contaminant migration. As can be seen, project costs are directly related to the period of time needed to achieve the site-specific goals.

ORC *Advanced*™ Delivery to Contaminated Zone

This product is normally applied to the subsurface using direct-push hydraulic equipment. Drive rods are pushed to the bottom of the contaminated saturated zone, and then ORC *Advanced* is injected as the rods are withdrawn. Drive rods with an inner diameter of at least 5/8 of an inch should be used to inject this material. At sites where direct-push is not feasible, auger-based equipment can be used to deliver ORC *Advanced* to the subsurface. Furthermore, where long-term treatment is required, permanent, small-diameter injection/re-injection wells may be the best application option.

If re-injection wells are used to apply ORC *Advanced*, the wells should be installed into regular boreholes with the annular space filled with aquarium gravel or an equivalent material. The permanent type injection wells should be constructed of Schedule 80 PVC pipe with wide screen slots (up to 0.04-inches). Generally, re-injection wells have diameters of one- to two-inches (25 to 50 mm) and are installed into six- to eight-inch (150 to 200 mm) boreholes. A thick (< three feet) bentonite seal should be installed at the top of the screened interval in order to minimize the possibility of short-circuiting during injection/installation activities.

For most projects, an ORC *Advanced* slurry mixture with a solids content of 20% to 40% by weight can be used. Typically, ORC *Advanced* slurries used during installation activities have a solids content of 30%, but this value may need to be adjusted in the field so that the required mass of ORC *Advanced* can be injected at each location. For example, less permeable soil types (e.g. clays) may require a higher ORC *Advanced* percentage solids content slurry since less volume can be injected per location. If re-injection wells are used, an ORC *Advanced* slurry with a solids content of 15% to 20% by weight should be used. The volume of water per injection location can be calculated from the following equation:

Volume of water (gallons/injection point): $\frac{\text{ORC Advanced lbs/hole}}{(8.34\ \text{lbs/gal water})(\%\ \text{ORC Advanced solids})}\left[1-(\%\ \text{ORC Advanced solids})\right]$

After the ORC *Advanced* slurry has been installed, we recommend using a "water chaser" to push the material out of the well and into the formation. The water chaser should have a volume of at least twice the ORC *Advanced* slurry that was just injected. It is critical that this task is completed because the ORC *Advanced* slurry can set-up and harden and render the re-injection well useless in the future.

One of the most critical aspects of a successful installation is having a pump that can properly install the material in the subsurface. Most direct-push contractors are equipped with grout pumps capable of installation. Typically, the pumps used for these types of product applications should have a pumping rate of at least three gallons per minute and a pressure rating of at least 500 pounds per square inch (psi). Failing to specify and use the appropriate equipment for this type of product installation may increase field time and result in improper application of the material. If you have any questions about purchasing, renting, or specifying a pump for a project, please contact the Technical Service Group staff at Regenesis.

Recommended Groundwater Monitoring Program for ORC *Advanced*™ Projects

In order to validate the effectiveness of natural attenuation processes (ORC *Advanced*-enhanced treatment), we recommend conducting groundwater monitoring at selected wells. Also, a baseline round of sampling should be performed to identify the aquifer conditions prior to the installation of this material. After ORC *Advanced* has been installed into the subsurface, groundwater samples can be collected on a bi-monthly or quarterly basis. Once the initial biodegradation and geochemical trends have been identified, the monitoring frequency can be changed to a semi-annual or annual program. The groundwater monitoring program should employ low flow groundwater sampling techniques and include the measurement of the following field/chemical parameters:

- All COCs
- Field redox parameters: oxidation-reduction potential (ORP), pH, dissolved oxygen (DO), dissolved manganese, and dissolved (ferrous) iron

- Biochemical Oxygen Demand ($BOD_{5\text{-day}}$) and Chemical Oxygen Demand (COD) at selected groundwater monitoring wells within treatment area

Groundwater Monitoring Locations

The following table outlines the suggested locations and significance of monitoring wells used to monitor the progress of an ORC *Advanced* -based project.

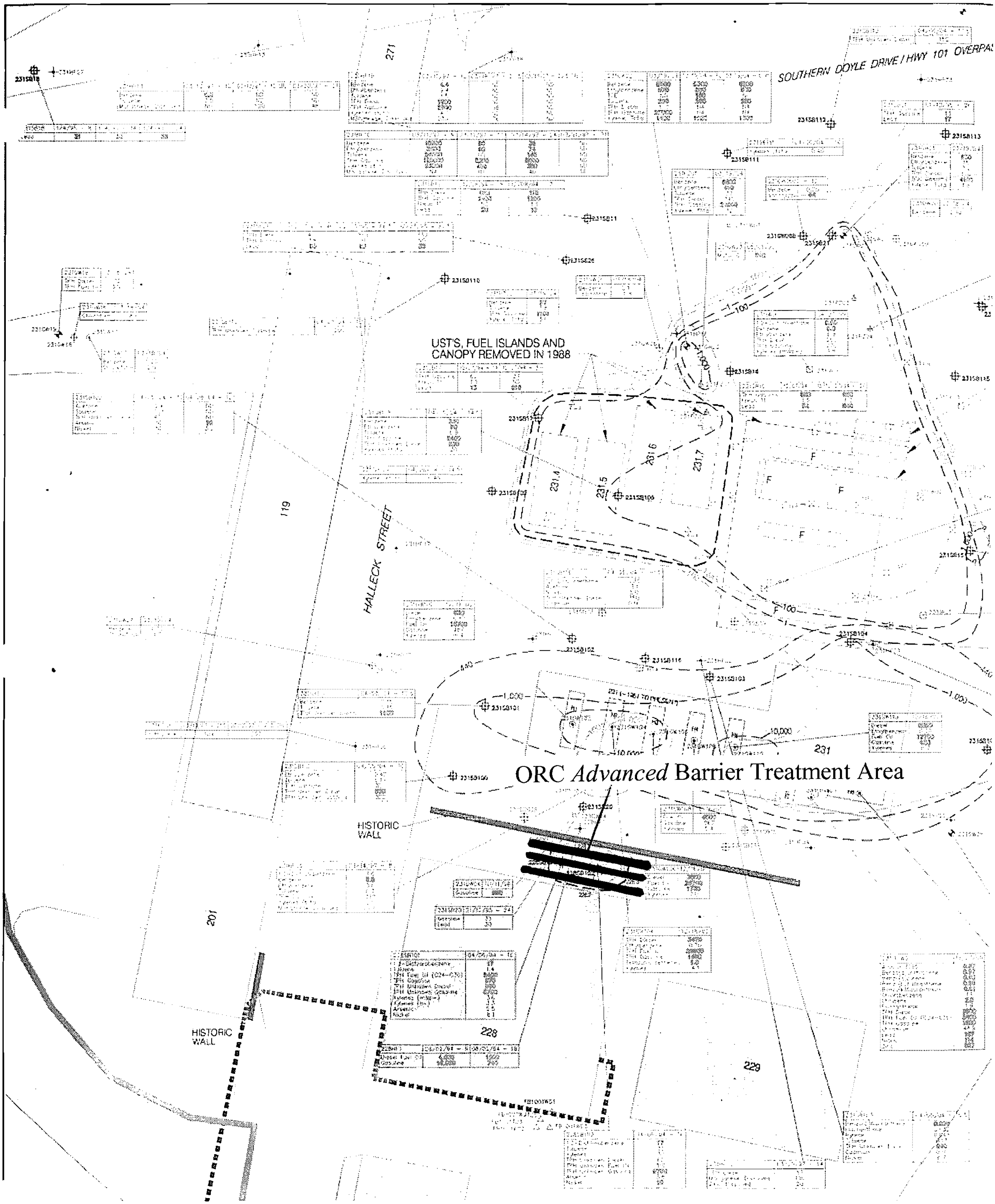
Location	Significance
Background (Outside the groundwater plume)	Allows for the changes in natural attenuation conditions induced by addition of ORC *Advanced* to be compared to background levels
Upgradient of treatment zone	Provides a measure of contaminant and competing electron acceptor flux entering treatment zone
Inside treatment zone	Provides information on how ORC *Advanced* is affecting the aquifer conditions and contaminant concentrations
Downgradient of treatment zone	Provides information on the effect ORC *Advanced* is having on the biodegradation rates of contaminants and on aquifer conditions and confirms the mitigation migration

Regenesis appreciates the opportunity to provide this information for your project. Please feel free to contact Jack Peabody, Regenesis' Western Regional Manager at (925) 944-5566 (e-mail at jpeabody@regenesis.com) or me at (949) 366-8000 x149 (e-mail at jbiondolillo@regenesis.com) any time to discuss this proposal.

Sincerely,

John Biondolillo

John Biondolillo
Manager of Technical Services – West Region



Treatment Area Diagram

NO	DATE	REVISIONS	BY	CHK	DRAWN CN ENGINEER NAM CHECKED DATE	PROJECT NO 4089041001 106 SCALE AS SHOWN APPROVED DATE	MACTEC

ORC *Advanced* Design Software for Barriers Using Slurry Injection

Aug 2006

Regenesis Technical Support: USA (949) 366-8000 www.regenesis.com

Site Name: Presidio Building 228 (San Francisco, CA)
Location: Barrier
Consultant: Margaret Stemper, MACTEC

Estimated Plume Requiring Treatment

Width of plume (intersecting gw flow direction)	40	ft		
Depth to contaminated zone	6	ft		
Thickness of contaminated saturated zone	14	ft		
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silty sand			
Effective porosity	0.2			
Hydraulic conductivity	1.25	ft/day	4.4E-04	cm/sec
Hydraulic gradient	0.022	ft/ft		
Seepage velocity	50.2	ft/yr	0.138	ft/day

Dissolved Phase Oxygen Demand: Individual species that represent oxygen demand:	Contaminant Conc. (mg/L)	Contaminant Loading (lb)	Stoichiometry (wt/wt) O_2/contam.	ORC-Adv Dose (lb)
Benzene	0.00	0.00	3.1	0
Toluene	0.00	0.00	3.1	0
Ethylbenzene	0.09	0.03	3.2	1
Xylenes	0.09	0.03	3.2	1
MTBE	0.00	0.00	2.7	0
cis-1,2-DCE	0.00	0.00	0.7	0
Vinyl Chloride	0.00	0.00	1.3	0
User added, add stoichiometric demand (see pull-down)	0.00	0.00	0.0	0
User added, add stoichiometric demand (see pull-down)	0.00	0.00	0.0	0
Reduced metals: Fe^{+2} and Mn^{+2}	10.00	3.51	0.1	2

<- pull-down menu

Measures of total oxygen demand				
Total Petroleum Hydrocarbons	9.60	3.37	3.1	62
Biological Oxygen Demand (BOD)	0.00	0.00	1.0	0
Chemical Oxygen Demand (COD)	0.00	0.00	1.0	0

Length of time to evaluate contaminant flow into barrier: 1 yr

Summary of Estimated ORC-Adv Requirement Measures	Dissolved Phase ORC-Adv Demand (lbs)	Additional Demand Factor (1 to 10x)	Total ORC-Adv Demand (lbs)	ORC-Adv Cost	
Total BTEX, MTBE, etc.	3	5.0	16	$224	
Total Petroleum Hydrocarbons	62	16.3	1,000	$8,969	<-
Biological Oxygen Demand (BOD)	0	2.0	0	$0	
Chemical Oxygen Demand (COD)	0	1.5	0	$0	

Required ORC-Adv quantity (in 25 lb increments) -------------------------------> **1,025** lbs ORC-Adv

Delivery Design for ORC-Adv Slurry

Spacing within rows (ft)	10.0	feet
Number of points per row	4	points/row
Number of rows	3.0	rows
Total number of points	12	points
ORC-Adv application rate	6.1	lbs/foot
Total ORC-Adv required	**1,025**	lbs of ORC-Adv

Slurry Mixing Volume for Injections

Pounds per location	85	pounds
Buckets per location	3.4	buckets
Design solids content (20-40% by wt. for injections)	30%	
Volume of water required per hole (gal)	24	gallons
Total water for mixing all holes (gal)	287	gallons
Simple ORC-Adv Backfilling: min hole diameter for 67% slurry	4.1	inches
Feasibility for slurry injection in sand: ok up to 15 lb/ft	(ok)	
Feasibility for slurry injection in silt: ok up to 10 lb/ft	(ok)	
Feasibility for slurry injection in clay: ok up to 10 lb/ft	(ok)	

Project Summary		
Number of ORC-Adv delivery points (adjust as necessary for site)		12
ORC-Adv application rate in lbs/ft (adjust as necessary for site)		6.1
ORC-Adv bulk material for slurry injection (lbs)		1025
Number of 25 lb ORC-Adv buckets		41.0
ORC-Adv bulk material cost ($/lb)	$	8.75
Cost for bulk ORC-Adv material	$	8,969
Shipping and Tax Estimates in US Dollars		
Sales Tax rate: 0.00%	$	-
Total Material Cost	$	8,969
Shipping (call for amount)	$	-
Total Regenesis Material Cost	**$**	**8,969**

ORC-Adv Slurry Injection Cost Estimate (responsibility of customer to contract work)		
Footage for each point = uncontaminated interval + ORC-Adv injection interval (f		20
Total length for direct push for project (ft)		240
Estimated daily installation rate (ft per day: 300 for push, 150 for drilling)		300
Estimated points per day (10 to 30 is typical for direct push)		15.0
Required number of days		1
Mob/demob cost for injection subcontractor	$	-
Daily rate for injection subcontractor ($1-2K for push, $3-4K for drill rig)	$	-
Total injection subcontractor cost for application	$	-
Total Install Cost (not including consultant, lab, etc.)	**$**	**8,969**

Other Project Cost Estimates		
Design	$	-
Permitting and reporting	$	-
Construction management	$	-
Groundwater monitoring and rpts	$	-
Other	$	-
Other	$	-
Other	$	-
Other	$	-
Total Project Cost	**$**	**8,969**

REGENESIS

DIRECTIONS FOR ORC *Advanced*™ SLURRY MIXING

1. Open the 5-gallon bucket and remove the pre-measured bag of ORC *Advanced* (each bag contains 25 lbs of ORC *Advanced*).

2. Measure and pour water into the 5-gallon bucket according to the desired slurry consistency (a slurry calculation table is available on the Regenesis software in the Appendix tab):

% Solids	Quantity of ORC *Advanced* (lbs)	Quantity of Water (gal)
65	25	1.6
60	25	2.0
55	25	2.5
50	25	3.0
45	25	3.7
40	25	4.5
35	25	5.6
30	25	7.0
25	25	9.0
20	25	12.0

3. Add the corresponding quantity of water to the pre-measured quantity of ORC *Advanced*.

4. Use an appropriate mixing device to thoroughly mix the ORC *Advanced* and water together. A hand-held drill with a "jiffy mixer" or a stucco mixer on it may be used in conjunction with a small paddle to scrape the bottom and sides of the container. Standard environmental slurry mixers may also be used, following the equipment instructions for operation. For small quantities, the slurry can be mixed by hand if care is taken to blend all lumps into the mixture thoroughly.

CAUTION: **ORC *Advanced* may settle out of slurry if left standing.** ORC *Advanced* eventually hardens into a cement-like compound and cannot be re-mixed after that has occurred. Therefore, mix immediately before using to ensure that the mixture has not settled out. **Do not let stand more than 30 minutes.** If a mechanical slurry mixer attached to a pump is being used, the material may be cycled back through the mixer to maintain slurry suspension and consistency.

REGENESIS

Oxygen Release Compound (ORC®)
&
Advanced Formula Oxygen Release Compound (ORC *Advanced*™)

INSTALLATION INSTRUCTIONS

SAFETY

Pure ORC and ORC *Advanced* are shipped as fine white and pale yellow powders, respectively. ORC is considered to be a mild oxidizer while ORC *Advanced* is considered an oxidizer therefore both products should be handled with care while in the field. Field personnel should take precautions while installing either the ORC or ORC *Advanced* product. Typically, the operator should work upwind of the products as well as use the appropriate personal protection equipment (PPE) which includes eye, respiratory protection, and gloves as deemed appropriate by exposure duration and field conditions. In addition, personnel operating the field equipment utilized during installation activities should have appropriate training, supervision and experience.

GENERAL GUIDELINES

ORC/ORC *Advanced* can be installed in the contaminated saturated zone in the ground utilizing hand-augured holes, direct-push, hollow stem augers or air/mud-rotary drilling techniques. For optimum results, the ORC/ORC *Advanced* slurry should be installed across the entire vertical contaminated saturated thickness, including the capillary fringe and "smear zone."

Two general approaches are available for installation of these products. The first is to inject the ORC/ORC *Advanced* slurry through direct-push drive rods across the contaminated saturated zone and the second is to backfill the application points with the ORC/ORC *Advanced* slurry. Using the injection method should increase oxygen dispersion in the zone of interest over the life of the project because the ORC/ORC *Advanced* slurry affects a larger zone right from the start. If the backfill method is used more time may be required for the completion of the remediation process because oxygen distribution will be most likely be less.

It is important that the installation method and specific ORC/ORC *Advanced* slurry point location be established prior to field installation. It is also important that the ORC/ORC *Advanced* slurry volume and solids content for each drive point be pre-determined. The Regenesis Technical Services Group is available to discuss these issues. The Helpful Hints at the end of these instructions offers relevant information. Further information regarding ORC/ORC *Advanced* is available on the Regenesis website at www.regenesis.com.

SPECIFIC INSTALLATION PROCEDURES

1. Identify the location of all underground structures, including utilities, tanks, and distribution piping, sewers, drains, and landscape irrigation systems.

2. Identify surface and aerial impediments.

3. Adjust planned installation locations for all impediments and obstacles.

4. Pre-mark the installation grid/barrier point locations, noting any that have special depth requirements.

5. Set up the unit over each specific point, following manufacturer recommended standard operating procedures (SOP).

The section below contains instructions for augured-hole (hollow stem or air/mud rotary) applications. For direct-push applications, go to the following section.

Instructions for Augured Hole Applications

6. Hand augering and solid stem auger applications will generally require the soil matrix to stay open during auger removal. If this is the method being used, the ORC/ORC *Advanced* slurry should be installed immediately upon tool removal from the borehole.

7. Mix the appropriate quantity of ORC/ORC *Advanced* slurry for the current application point. Do not mix more slurry than will be used within a 30-minute period because the slurry could solidify and become useless.

8. Where soil conditions are unstable in the saturated zone, we recommend using a thicker ORC/ORC *Advanced* slurry. A solids content of 65-67% (consistency of toothpaste) is appropriate in these situations, since it comes relatively close to mimicking the density of soil.

9. **Tremie pipe option #1**: The slurry may be pumped through standard geotechnical slurry pumps and a tremie hose/pipe. We strongly recommend following the equipment manufacturer's standard operating instructions. Regenesis recommends that the tremie application be performed from the bottom of the hole up to the top of the capillary fringe. This is especially important if there is groundwater in the bottom of the installation hole, since it serves to maintain the densest portion of the ORC/ORC *Advanced* slurry mix.

10. **Tremie pipe option #2**: In relatively shallow situations, a tremie pipe may be used. Depending on the open hole diameter, a PVC tremie pipe with a one- to two-inch diameter may be used. The hole should be filled from the bottom of the hole to the top of the capillary fringe. It is normally a good idea, and may sometimes be a necessity, to use a "plunger" inside the tremie pipe to push the slurry through as the pipe is withdrawn. A funnel to pour slurry into the tremie pipe is advised.

11. **Hollow-stem auger option #1**: If the borehole being drilled would collapse during tool removal, augering applications require a hollow stem. By drilling with a plug in place, an open temporary source hole is created. The slurry may be installed with a tremie pipe or a tremie pump, following the pump manufacturer's operating instructions. Depending on the saturated zone soil conditions, it may be necessary to carefully coordinate the rate of auger withdrawal with the rate of slurry addition to preserve the hole void space for acceptance of the slurry.

12. **Hollow stem auger option #2 (auger as "tremie pipe")**: When soil conditions in the saturated zone are unstable and borehole collapse is likely, the hollow stem auger may be used as a tremie pipe. Prior to dropping the auger plug at the bottom of the hole, the ORC/ORC *Advanced* slurry is poured directly into the hollow stem, in a volume equal to the expected requirement for the hole. A plunger inside the auger is used to push the slurry down in the hole to keep it there as the auger is removed.

Skip the next section and proceed to Step 13.

For Direct-Push Applications

6. Push the drive rods (A 1.5-inch pre-probe can be used but is not recommended) with the detachable tip to the maximum desired depth. Standard drive rods (typically 1.25-inch O.D.) should be used. Pre-counted drive rods should be positioned prior to the installation driving procedure to assure the desired depth is reached.

7. Disconnect the drive rods from the implantable tip, following standard equipment procedures.

8. Mix the appropriate quantity of ORC/ORC *Advanced* slurry for the current injection point. Do not mix more slurry than will be used within a 30-minute period.

9. Set up and operate an appropriate slurry pump according to manufacturer's directions. Connect the pump to the probe puller/injector connector via a standard delivery hose. The hose is then attached to the drive rod with its quick disconnect fitting. Upon confirmation of all connections, add the ORC/ORC *Advanced* slurry to the pump hopper/tank.

10a. **Injection Application (if this is a backfill application, go to step 10b)**: While slowly withdrawing the drive rods, pump the pre-determined amount of ORC/ORC *Advanced* slurry into the aquifer. Typically, ORC/ORC *Advanced* injection rates are based on pounds of material installed per foot of vertical treatment. Observe pump pressure levels for indications of slurry dispersion and/or slurry refusal into aquifer (increasing pressure indicates reduced acceptance of material by the aquifer). As an optional pre-treatment step, pump one to two gallons of tap water into the aquifer to enhance dispersion pathways from the probe hole.

10b. **Backfill Application**: Pump the pre-determined quantity of ORC/ORC *Advanced* slurry into the borehole being treated. Observe pump pressure levels for indications of slurry dispersion

and/or slurry refusal into aquifer (increasing pressure indicates reduced acceptance of material by the aquifer).

11. Remove one four-foot section of the drive rod. If the drive rod contains slurry, return it to the ORC/ORC *Advanced* bucket/pump hopper for reuse.

12. Repeat steps 10 and 11 until treatment of the entire targeted thickness has been achieved. It is generally recommended that the procedure extend to the top of the capillary fringe/smear zone.

13. Place an appropriate seal, such as bentonite, above the ORC/ORC *Advanced* slurry through the entire vadose zone. This helps ensure that the slurry stays in place and prevents contaminants from migrating go the surface. Depending on soil conditions and local regulations, a bentonite seal can be pumped through the grout pump or added via chips or pellets after the drive rods have been removed.

14. Remove and decontaminate the drive rods and pre-probe (optional).

15. Finish the probe hole at surface as appropriate (concrete or asphalt cap, if necessary).

16. Move to the next injection point, repeating steps 5 through 15.

HELPFUL HINTS

1) Physical characteristics

The ORC/ORC *Advanced* slurry is made using the dry ORC/ORC *Advanced* powder makes a smooth slurry, the consistency of which depends on the amount of water used.

A 65-67% solids content ORC/ORC *Advanced* slurry (consistency of toothpaste) is thick but can still be pumped easily. This solids content slurry is normally used for back filling a borehole or probe hole. It is especially useful in situations where maximum density is desired, such as when ground water is present in the hole or when there are heaving sands.

As a rule, it is best to mix the first batch of slurry at the maximum solids content one would expect to use. The slurry can then be thinned by adding water in small increments. By monitoring this process, the appropriate quantities of water for subsequent batches can be determined.

The slurry should be mixed at about the time it is expected to be used. It is best not to hold it for longer than 30 minutes. Thinner slurries can experience separation if they stand too long. All solids content ORC/ORC *Advanced* slurries have a tendency to form a weak cement when left standing for extended periods or time. If a slurry begins to thicken too much, it should be mixed again and additional water should be added.

1011 Calle Sombra · San Clemente, CA 92673 · tel: 949.366.8000 · fax: 949.366.8090

tech@regenesis.com · www.regenesis.com

The ORC/ORC *Advanced* slurry should not be left sitting inside a grout pump or hose for extended periods because it will begin to set-up and harden. This problem can generally be avoided by re-circulating the slurry through the pump and hose back into the pump's hopper or mixing tank.

2) *Pump Equipment Cleaning and Maintenance*

Pumping equipment and drive rods can be lightly cleaned by circulating clear water through them. If necessary, further cleaning and decontamination should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

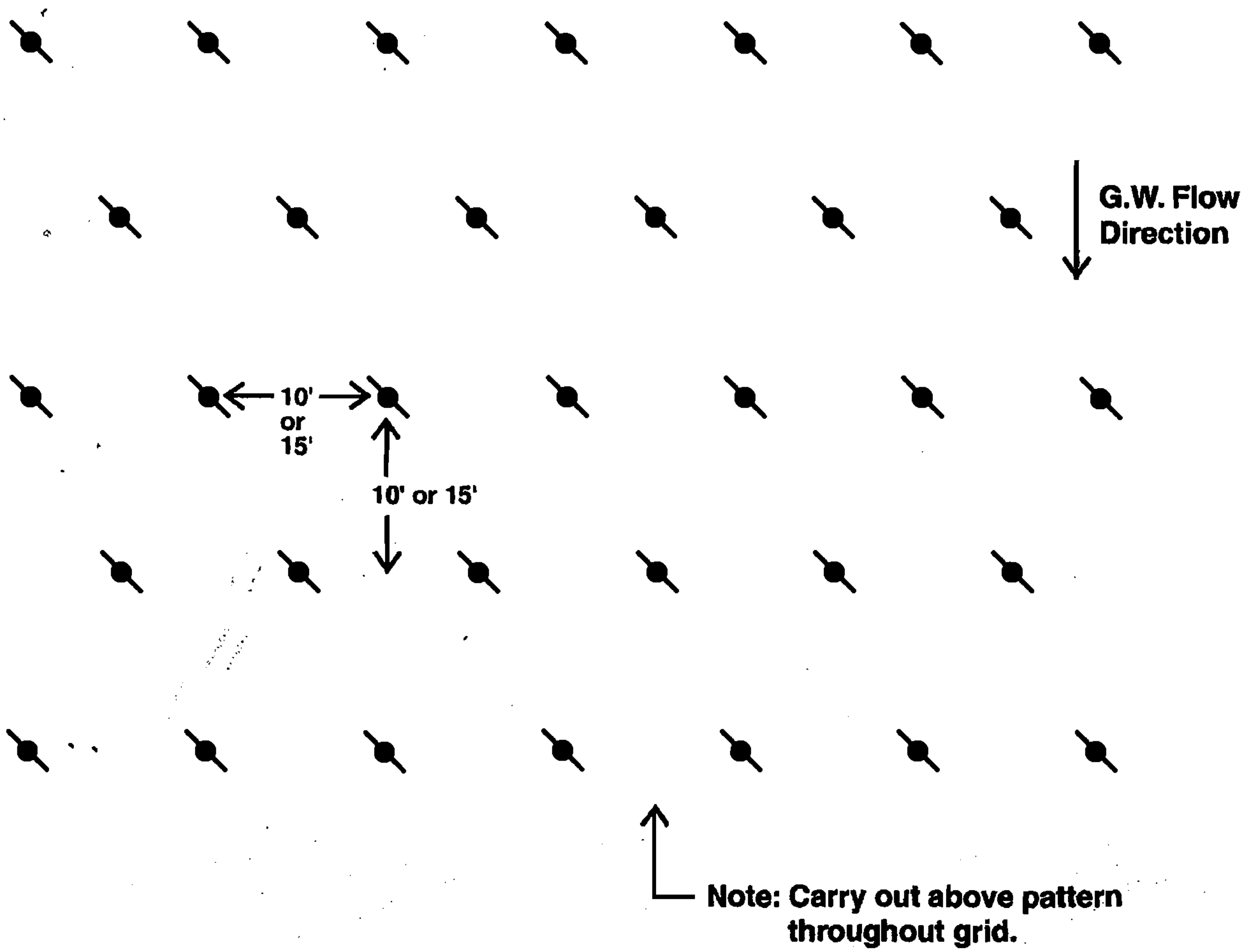
3) *General Operating Procedures for Backfill Applications*

When performing a backfill installation, it is important to fill the appropriate portion of the hole with a thick (65-67% solids content) slurry that will solidify in place. Moderate amounts of pressure should be used to avoid fracturing the soil matrix or pumping slurry into the soil.

The operator should use care and monitor pumping pressures and quantities to ensure that the hole is being filled without pushing excess material into the soil matrix. Ideally, the rate of slurry pumping will be coordinated with the rate of drive rod withdrawal. It is usually important to install the slurry material to the top of the capillary fringe.

In addition, it is important that the entire contaminated saturated zone is treated (including the capillary fringe), as this is often the location of highest contaminant concentrations. Failure to properly treat this area can undermine an otherwise successful remediation effort.

TYPICAL ORC INJECTION GRID LAYOUT



Legend

ORC Injection Point

Note: Do not place Injection Points closer than 5 feet to monitoring wells.

PRICE SHEET

To order call: 949-366-8000
Fax: 949-366-8090

ORC® ADVANCED
OXYGEN RELEASE COMPOUND

REGENESIS
Advanced Technologies for Groundwater Resources

Effective Date: August 15, 2006

Oxygen Release Compound Advanced (ORC Advanced®) offers a low-cost, in situ approach to accelerating bioremediation at contaminated soil and groundwater sites. ORC Advanced is a unique calcium oxyhydroxide-based chemical formulation incorporating patented Controlled Release Technology (CRT™). When emplaced into the contaminated subsurface and hydrated, ORC Advanced releases 17% of its weight as oxygen at a controlled rate for periods of up to 12 months. This controlled release of oxygen cost-effectively stimulates naturally occurring microbes which rapidly degrade a wide range of aerobically degradable contaminants.

ORC Advanced Powder (Bulk Pricing)	
Quantity (lbs.)	**Price/lb (US $)**
*50 – 999	$8.95
1000-2499	$8.75
2500-4999	$8.50
5000-9999	$8.25
> 10,000	Contact Regenesis

NOTE: Bulk ORC Advanced Powder is shipped in five gallon PVC buckets weighing approximately 25 pounds each. Material Safety Data Sheet (MSDS) and Installation Instructions are included with each shipment.

***Minimum Order:** 50 lbs. or $447.50

Terms & Conditions: Other Terms & Conditions are on reverse side.

Freight – All freight is FOB Regenesis Warehouse. Shipping warehouse will be determined by inventory levels and proximity to destination.

Payment Terms: Net 30 Days. Accounts outstanding after 30 days will be assessed 1.5% monthly interest. Accounts outstanding for purchase of ORC Advanced powder over 90 days will be re-invoiced at the undiscounted price of $8.95/lb.

Return Policy: A 15% re-stocking fee will be charged for all returned goods. Return freight must be prepaid. All requests to return product must be pre-approved by Regenesis. Returned product must be in original condition and no product will be accepted for return after a period of 90 days from time of delivery.

Remittance Address: Department 8873, Los Angeles, CA 90084-8873

REGENESIS

Oxygen Release Compound Advanced (ORC Advanced™)
TERMS AND CONDITIONS

1. CASUALTY AND AVAILABILITY OF RAW MATERIALS. REGENESIS Bioremediation Products ("Seller") shall not be liable for delays in delivery or failure to manufacture or deliver due to causes beyond its reasonable control, including but not limited to acts of God, acts of buyer, acts of military or civil authorities, fires, strikes, flood, epidemic, war, riot, delays in transportation or car shortages, or inability to obtain necessary labor, materials, components or services through seller's usual and regular sources at usual and regular prices. In any such event seller may, without notice to buyer, at any time and from time to time, postpone the delivery dates under this contract or make partial delivery or cancel all or any portion of this and any other contract with buyer without further liability to buyer. Cancellation of any part of this order shall not affect seller's right to payment for any product delivered hereunder.

2. LIMITED WARRANTY. Seller warrants that the product sold hereunder is made with ORC Advanced as specified on face of invoice. Seller makes no other warranty of any kind respecting the product, and expressly DISCLAIMS ALL OTHER WARRANTIES OF WHATEVER KIND RESPECTING THE PRODUCT, INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE. BUYER'S SOLE REMEDY FOR BREACH OF THIS LIMITED WARRANTY SHALL BE REFUND OF THE PURCHASE PRICE, PROVIDED THAT ANY UNUSED PORTION OF THE PRODUCT IS PROMPTLY RETURNED TO SELLER. UNDER NO CIRCUMSTANCES WILL SELLER BE LIABLE FOR ANY CONSEQUENTIAL OR OTHER DAMAGES.

3. DISCLAIMER. Seller disclaims to the full extent permitted by law all warranties, expressed or implied, including any implied warranty of merchantability, fitness for any particular purpose or against infringement, to any person other than buyer. Where warranties to a person other than buyer may not be disclaimed under law, seller extends to such a person the same warranty seller makes to buyer or lessee as set forth herein, subject to all disclaimers, exclusions and limitations of warranties, all limitations of liability and all other provisions set forth in the Terms and Conditions herein. Buyer agrees to transmit a copy of the Terms and Conditions set forth herein to any and all persons to whom buyer sells, or otherwise furnishes the products and/or services provided buyer by seller and buyer agrees to indemnify seller for any liability, loss, costs and attorneys' fees which seller may incur by reason, in whole or in part, of failure by buyer to transmit the Terms and Conditions as provided herein.

4. LIMITATION OF SELLER'S LIABILITY AND LIMITATION OF BUYER'S REMEDY. Seller's liability on any claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair or use of any goods or services covered by or furnished hereunder, shall in no case exceed the lesser of the cost of repairing or replacing goods failing to conform to the forgoing warranty or the price of the goods or services or part thereof which gives rise to the claim. IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR DAMAGES IN THE NATURE OF PENALTIES.

5. INDEMNIFICATION. Buyer agrees to defend and indemnify seller of and from any and all claims or liabilities asserted against seller in connection with the manufacture, sale, delivery, resale or repair or use of any goods covered by or furnished hereunder arising in whole or in part out of or by reason of the failure of buyer, its agents, servants, employees or customers to follow instructions, warnings or recommendations furnished by seller in connection with such goods, by reason of the failure of buyer, its agents, servants, employees or customers to comply with all federal, state and local laws applicable to such goods, or the use thereof, including the Occupational Safety and Health Act of 1970, or by reason of the negligence of buyer, its agents, servants, employees or customers.

6. EXPENSES OF ENFORCEMENT. In the event Seller undertakes any action to collect amounts due from Buyer, or otherwise enforce its rights hereunder, Buyer agrees to pay and reimburse Seller for all such expenses, including, without limitation, all attorneys and collection fees.

7. TAXES. Liability for all taxes and import or export duties, imposed by any city, state, federal or other governmental authority, shall be assumed and paid by buyer. Buyer further agrees to defend and indemnify seller against any and all liabilities for such taxes or duties and legal fees or costs incurred by seller in connection therewith.

8. ASSISTANCE AND ADVICE. Upon request, seller in its discretion will furnish as an accommodation to buyer such technical advice or assistance as is available in reference to the goods. Seller assumes no obligation or liability for the advice or assistance given or results obtained, all such advice or assistance being given and accepted at buyer's risk.

9. ENTIRE AGREEMENT. This agreement constitutes the entire contract between buyer and seller relating to the goods or services identified herein. No modifications hereof shall be binding upon the seller unless in writing and signed by seller's duly authorized representative, and no modification shall be effected by seller's acknowledgment or acceptance of buyer's purchase order forms containing different provisions. Trade usage shall neither be applicable nor relevant to this agreement, nor be used in any manner whatsoever to explain, qualify or supplement any of the provisions hereof. No waiver by either party of default shall be deemed a waiver of any subsequent default.

TABLE 4
STATUS OF GROUNDWATER MONITORING - BUILDING 637 AREA
Presidio of San Francisco, California

Well ID	Water-Bearing Zone	Objectives of Monitoring Well	Analytes and Analytical Methods (a)	Required Monitoring Frequency and Duration	Groundwater Monitoring Summary (b)	Proposed Future Work
637-01R	A2	Monitor groundwater flow direction in A2 Zone. Measure TPH-g and BTEX.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 1 year.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 8 times from June 2000 to December 2002. The maximum TPH-g and xylenes concentrations detected in groundwater were 190 ug/l and 0.9 ug/l, respectively, which are less than the applicable groundwater cleanup levels for TPH-g and xylenes of 13,000 ug/l and 232,000 ug/l, respectively. Benzene, toluene, and ethylbenzene were not detected in groundwater samples.	NFA (c)
637-19	A2	Monitor groundwater flow direction in A2 Zone. Measure TPH-g and BTEX.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 1 year.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 7 times from May 2001 to December 2002. The maximum xylenes concentration detected in groundwater was 2.7 ug/l, which is less than the applicable groundwater cleanup level for xylenes of 232,000 ug/l. TPH-g, benzene, toluene, and ethylbenzene were not detected in groundwater samples.	NFA (c)
637-26	A1	Monitor groundwater flow direction in A1 Zone. Measure TPH-g, BTEX, and DO downgradient of ORC treatment area.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B) DO (DO Field Probe)	Quarterly for 2 years.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 8 times from June 2000 to December 2002. The maximum TPH-g, ethylbenzene, and xylenes concentrations detected in groundwater were 620 ug/l, 2.4 ug/l, and 4.9 ug/l, respectively, which are less than the applicable groundwater cleanup levels for TPH-g, ethylbenzene, and xylenes of 13,000 ug/l, 1,000 ug/l, and 232,000 ug/l, respectively. Benzene and toluene were not detected in groundwater samples.	NFA (c)

TABLE 4
STATUS OF GROUNDWATER MONITORING - BUILDING 637 AREA
Presidio of San Francisco, California

Well ID	Water-Bearing Zone	Objectives of Monitoring Well	Analytes and Analytical Methods (a)	Required Monitoring Frequency and Duration	Groundwater Monitoring Summary (b)	Proposed Future Work
637-27	A1	Monitor groundwater flow direction in A1 Zone. Measure TPH-g and BTEX.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 1 year.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 7 times from May 2001 to December 2002. TPH-g and BTEX were not detected in groundwater samples.	NFA (c)
637-33	A2	Monitor groundwater flow direction in A2 Zone. Measure TPH-g and BTEX.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 1 year.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 7 times from May 2001 to December 2002. TPH-g and BTEX were not detected in groundwater samples.	NFA (c)
637-34	A1	Monitor groundwater flow direction in A1 Zone. Wetland early-detection well (west of sentry wells).	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 2 years, semi-annually thereafter. (d)	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 10 times from June 2000 to August 2003. TPH-g and BTEX were not detected in groundwater samples.	NFA (c)
637-35	A1	Monitor groundwater flow direction in A1 Zone. Wetland sentry well.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 2 years, semi-annually thereafter. (d)	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 10 times from June 2000 to August 2003. The maximum xylenes concentration detected in groundwater was 0.63 ug/l, which is less than the applicable groundwater cleanup level for xylenes (within 150 feet of wetlands) of 130 ug/l. TPH-g, benzene, toluene, and ethylbenzene were not detected in groundwater samples. TPH-g and BTEX concentrations have been non-detect for 5 consecutive monitoring events.	NFA (c)
637-36	A1	Monitor groundwater flow direction in A1 Zone. Wetland sentry well.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 2 years, semi-annually thereafter. (d)	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 10 times from May 2001 to August 2003. TPH-g and BTEX were not detected in groundwater samples.	NFA (c)

TABLE 4

STATUS OF GROUNDWATER MONITORING - BUILDING 637 AREA

Presidio of San Francisco, California

Well ID	Water-Bearing Zone	Objectives of Monitoring Well	Analytes and Analytical Methods (a)	Required Monitoring Frequency and Duration	Groundwater Monitoring Summary (b)	Proposed Future Work
637-37	A1	Monitor groundwater flow direction in A1 Zone. Wetland sentry well.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B)	Quarterly for 2 years, semi-annually thereafter. (d)	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 10 times from June 2000 to August 2003. TPH-g and BTEX were not detected in groundwater samples above laboratory reporting limits.	NFA (c)
637-38	A1	Monitor groundwater flow direction in A1 Zone. Measure TPH-g, BTEX, and DO downgradient of ORC treatment area.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B) DO (DO Field Probe)	Quarterly for 2 years.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 9 times from June 2000 to March 2003. The maximum TPH-g, toluene, and xylenes concentrations detected in groundwater were 320 ug/l, 4.8 ug/l, and 1.2 ug/l, respectively, which are less than the applicable groundwater cleanup levels for TPH-g, toluene, and xylenes of 13,000 ug/l, 2,100 ug/l, and 232,000 ug/l, respectively. Benzene and ethylbenzene were not detected in groundwater samples.	NFA (c)
637-39R	A1	Monitor groundwater flow direction in A1 Zone. Measure TPH-g, BTEX, and DO downgradient of ORC treatment area.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B) DO (DO Field Probe)	Quarterly for 2 years.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 7 times from August 2001 to March 2003. TPH-g and BTEX were not detected in groundwater samples.	NFA (c)

TABLE 4
STATUS OF GROUNDWATER MONITORING - BUILDING 637 AREA
Presidio of San Francisco, California

Well ID	Water-Bearing Zone	Objectives of Monitoring Well	Analytes and Analytical Methods (a)	Required Monitoring Frequency and Duration	Groundwater Monitoring Summary (b)	Proposed Future Work
637-40	A2	Monitor groundwater flow direction in A2 Zone. Measure HVOC concentrations until MCLs are achieved.	HVOCs (EPA 8260)	Annually until MCLs achieved for 2 consecutive monitoring events.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 8 times from May 2001 to March 2003. The maximum TPH-g, benzene, toluene, ethylbenzene, and xylenes concentrations detected in groundwater were 85 ug/l, 0.88 ug/l, 0.97 ug/l, 1.2 ug/l, and 5.6 ug/l, respectively. These concentrations are less than the applicable groundwater cleanup levels for TPH-g, benzene, toluene, ethylbenzene, and xylenes of 13,000 ug/l, 650 ug/l, 2,100 ug/l, 1,000 ug/l, and 232,000 ug/l, respectively. The maximum acetone, c-1,2-DCE, PCE, and vinyl chloride concentrations detected in groundwater were 20 ug/l, 0.9 ug/l, 1.7 ug/l, and 1.1 ug/l, respectively. An MCL for acetone does not exist. The c-1,2-DCE and PCE concentrations are less than their MCLs of 6 ug/l and 5 ug/l, respectively. The maximum vinyl chloride concentration is greater than its MCL of 0.5 ug/l. No other VOCs have been detected. All HVOC concentrations have been below their MCLs for the 2 most recent consecutive monitoring events; thus, the HVOC cleanup level has been met.	NFA (c)

TABLE 4
STATUS OF GROUNDWATER MONITORING - BUILDING 637 AREA
Presidio of San Francisco, California

Well ID	Water-Bearing Zone	Objectives of Monitoring Well	Analytes and Analytical Methods (a)	Required Monitoring Frequency and Duration	Groundwater Monitoring Summary (b)	Proposed Future Work
LF07GW11	A1	Monitor groundwater flow direction in A1 Zone. Measure TPH-g, BTEX, and DO downgradient of ORC treatment area.	TPH-g (EPA 8015M) BTEX (EPA 8021B or 8260B) DO (DO Field Probe)	Quarterly for 2 years.	Remedial activities were completed in March 2000. The Presidio Trust collected groundwater samples from this well 9 times from July 2000 to December 2002. The maximum TPH-g, benzene, toluene, and xylenes concentrations detected in groundwater were 240 ug/l, 2.6 ug/l, 0.7 ug/l, and 0.73 ug/l, respectively. These concentrations are less than the applicable groundwater cleanup levels for TPH-g, benzene, toluene, and xylenes of 13,000 ug/l, 650 ug/l, 2,100 ug/l, and 232,000 ug/l, respectively. Ethylbenzene has not been detected in groundwater samples.	NFA (c)

Notes:

(a) Analytical methods are U.S. Environmental Protection Agency methods (SW-846, Update III), unless otherwise indicated.

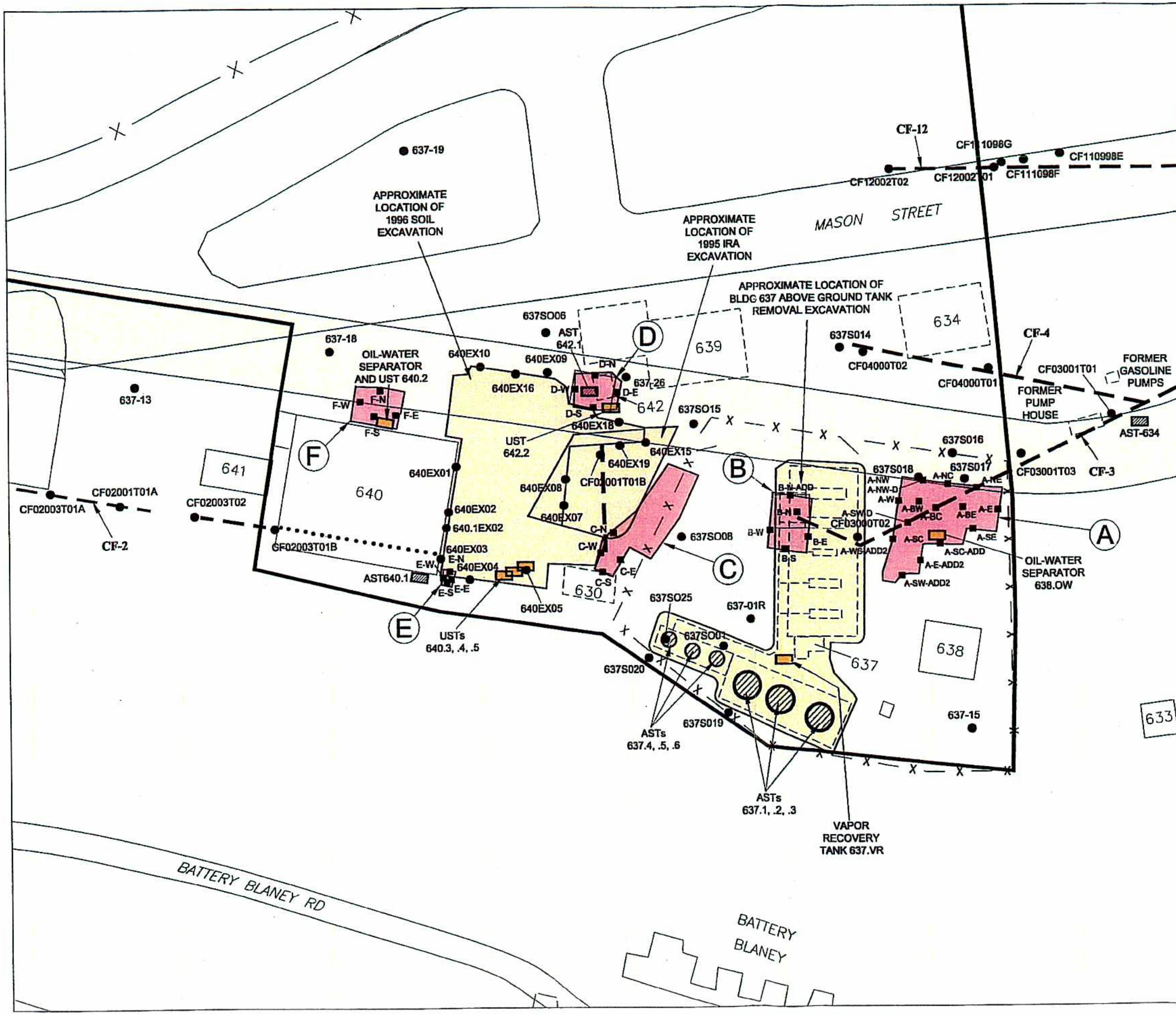
(b) Groundwater monitoring data are tabulated in Appendix B of this document.

(c) The results of groundwater monitoring indicated the requirements of the CAP have been met and no further action ("NFA") is necessary for groundwater, except for the proper decommissioning of the existing monitoring wells.

(d) In accordance with the CAP, the Trust may request to terminate groundwater monitoring after 3 years if at least one of the following conditions is met: (1) the groundwater flow direction in the Building 637 Area is consistently to the north or northwest (i.e., not toward the wetlands); (2) TPH-g has not been detected in the wells for the last four consecutive rounds of monitoring; or (3) the trend of TPH-g concentrations is shown to be stable or decreasing using a statistical evaluation.

Abbreviations:

BTEX	benzene, toluene, ethylbenzene, and xylenes
c-1,2-DCE	cis-1,2-dichloroethene
CAP	Final Corrective Action Plan, Building 637 Area
DO	dissolved oxygen
HVOCs	halogenated volatile organic chemicals
MCLs	Maximum Contaminant Levels
NFA	no further action
ORC	Oxygen Release Compound, provided by Regenesis
PCE	tetrachloroethene
TPH-g	total petroleum hydrocarbons quantified as gasoline
VOCs	volatile organic compounds



N

0 60 120

(Approximate Scale in Feet)

LEGEND

- Building 637 Area Boundary
- Fence
- Former Building or Structure Location
- Mason Street Realignment
- Former Aboveground Storage Tank (AST) Location
- Former Underground Storage Tank (UST) Location
- Shallow Soil Sampling Location
- Trust Confirmation Soil Sampling Location
- Army Excavation Area
- Trust Excavation Area
- Former Fuel Distribution System (FDS) Line
- FDS Line Abandoned in Place
- 634 Building and Number
- A Trust Excavation Area ID
- CF-2 FDS Section ID

Notes:

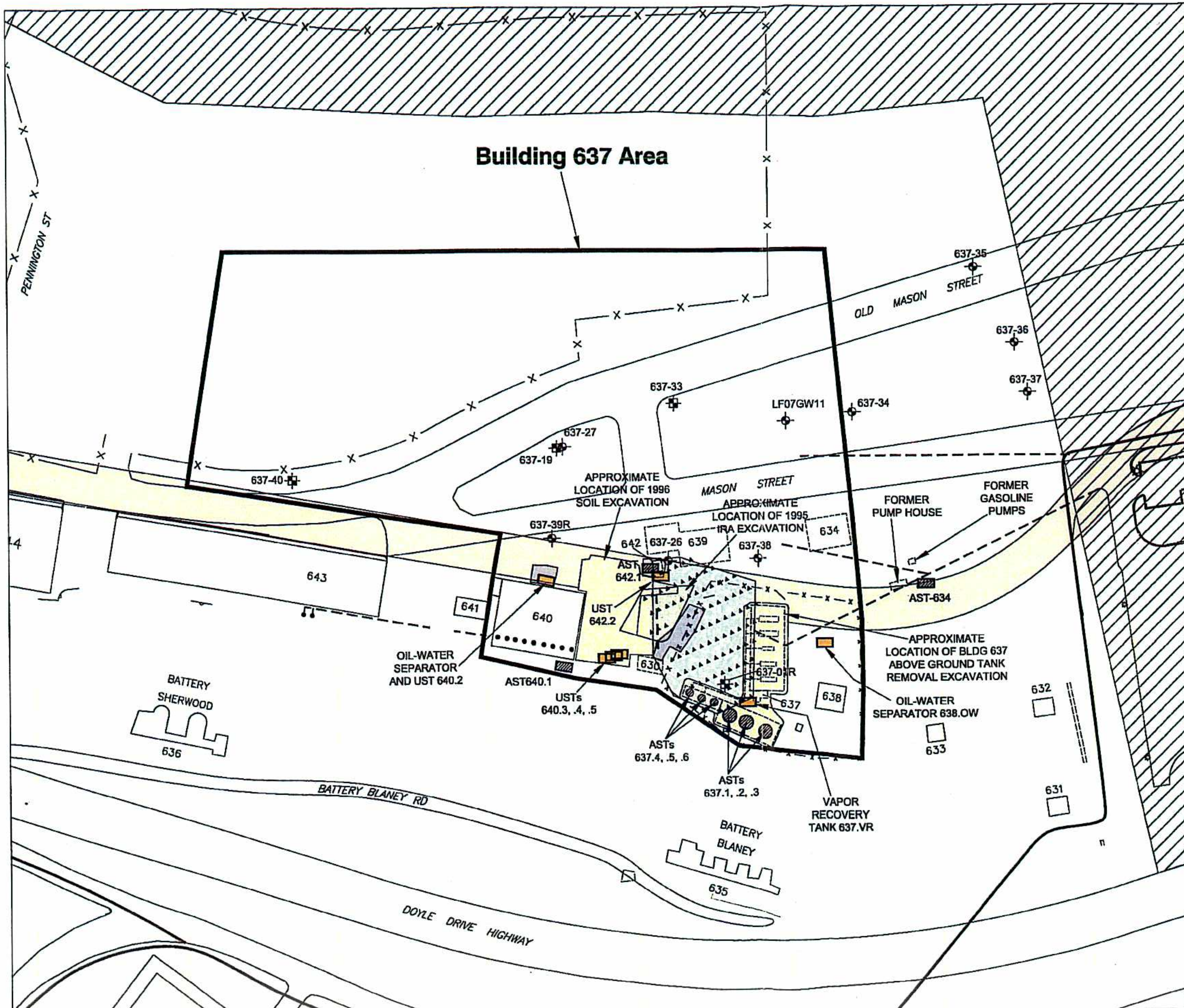
1. All locations are approximate.
2. Base map was provided by Department of the Interior, National Park Service.
3. The size and orientation of the USTs and ASTs are schematic (e.g., not representative of actual sizes).
4. Shallow soil indicates soil samples collected from depths less than 4 feet below ground surface ("bgs").
5. The northern portion of Area C was excavated to fixed dimensions; confirmation sampling was not conducted.

Erler & Kalinowski, Inc.

Final Extent of Excavations
Building 637 Area

THE PRESIDIO TRUST

Presidio Trust
San Francisco, CA
March 2004
EKI A000003.10
Figure 2



N

0 120 240

(Approximate Scale in Feet)

LEGEND

- Fence
- Former Building or Structure Location
- Mason Street Realignment
- A1 Zone Monitoring Well
- A2 Zone Monitoring Well
- Saltwater Ecological Protection Zone
- Former Aboveground Storage Tank (AST) Location
- Former Underground Storage Tank (UST) Location
- Former Excavation Area
- Former Fuel Distribution System (FDS) Line
- FDS Line Abandoned in Place
- 634 Building and Number
- Location Where ORC was Placed Excavation Backfill (4 to 6 feet bgs)
- Approximate ORC Injection Area ("▸" Represents Approximate ORC Injection Point)

Notes:

1. All locations are approximate.
2. Base map was provided by Department of the Interior, National Park Service.
3. The size and orientation of the USTs and ASTs are schematic (e.g., not representative of actual sizes).

Erler & Kalinowski, Inc.

ORC Treatment Areas and Monitoring Well Network Building 637 Area

Presidio Trust
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Figure 3

APPENDIX F

STANDARD OPERATING PROCEDURES (SOPS) FOR SOIL SAMPLING AND MONITORING WELL INSTALLATION ACTIVITIES

SOP APPROVAL FORM

THE PRESIDIO TRUST

ENVIRONMENTAL STANDARD OPERATING PROCEDURE

SOIL SAMPLING

SOP NO. 001

REVISION NO. 00

Last Reviewed: December 2000

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1.0 BACKGROUND

Soil sampling is conducted for three main reasons. First, samples can be obtained for laboratory chemical analysis. Second, samples can be obtained for laboratory physical analysis. Third, samples can be obtained for visual classification and field screening. These three sampling objectives can be achieved separately or in combination with each other. Sampling locations are typically chosen to provide chemical, physical, or visual information in both the horizontal and vertical directions. A sampling and analysis plan is used to outline sampling methods and provide preliminary rationale for sampling locations. Sampling locations may be adjusted in the field based on the screening methods being used and the physical features of the area.

1.1 PURPOSE

Soil sampling is conducted to determine the chemical, physical, and visual characteristics of surface and subsurface soils.

1.2 SCOPE

This standard operating procedure (SOP) describes procedures for soil sampling in different areas using various implements. It includes procedures for test pit, surface soil, and subsurface soil sampling, and describes eight devices. It also discusses procedures for collecting soil samples for volatile organic compound (VOC) analysis using the EnCore™ soil sampler system.

1.3 DEFINITIONS

Hand Auger: Instrument attached to the bottom of a length of pipe that has a crossarm or "T"-handle at the top. The auger can be closed-spiral or open-spiral.

Bucket Auger: A type of auger that consists of a cylindrical bucket 10 to 72 inches in diameter with teeth arranged at the bottom.

Core Sampler: Thin-wall cylindrical metal tube with diameter of 0.5 to 3 inches, a tapered nosepiece, a T-handle to facilitate sampler deployment and retrieval, and a check valve (flutter valve) in the headpiece.

Spatulas or Spoons: Stainless steel instruments for collecting loose unconsolidated material.

Trier: Tube cut in half lengthwise with a sharpened tip that allows for collection of sticky solids or loosening of cohesive soils.

Trowel: Tool with a scooped blade 4 to 8 inches long and 2 to 3 inches wide and has a handle.

Split-Spoon (or Split-Barrel) Sampler: Thick-walled steel tube that is split lengthwise. A cutting shoe is attached to the lower end; the upper end contains a check valve and is connected to drill rods.

Thin-Wall Tube Sampler: Steel tube (1 to 3 millimeters thick) with tapered bottom edge for cutting. The upper end is fastened to a check valve that is attached to drill rods.

1.4 REFERENCES

Barth, D.S., and B.J. Mason. 1984. "Soil Sampling Quality Assurance Users Guide." EPA 600/4-84-043.

DeVara, E.R., B.P. Simmons, R.D. Stephens, and D.L. Storm. 1980. "Samplers and Sampling Procedures for Hazardous Waste Streams." EPA 600/2-80-018. January.

Mason, B.J. 1983. "Preparation of Soil Sampling Protocol: Techniques and Strategies." EPA 600/4-83-020.

U.S. Environmental Protection Agency (EPA). 1987. "A Compendium of Superfund Field Operations Methods." Office of Solid Waste and Emergency Response Directive 9355.0-14 (EPA/540/P-87/001).

EPA. 1991. "Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells." EPA/600/4-89/034. March.

EPA. 1994. "Soil Sampling." Environmental Response Team SOP No. 2012. Revision No. 0.0. November 16. (On-Line Address: http://www.ert.org/media_resrcs/media_resrcs.asp.)

1.5 REQUIREMENTS AND RESOURCES

Soil sampling requires that one or more of the following types of equipment be used:

Sampling Equipment	Other Required Equipment
Spoons and spatulas	Sample containers, labels, and chain-of-custody forms
Trowel	Logbook
Shovel or spade	Measuring tape
Trier	Soil classification guidelines
Core sampler	Wax for sealing ends of thin-wall tube

Hand auger	Plastic sheeting
Bucket auger	Decontamination equipment
Split-spoon	Drilling equipment
Thin-wall tube	Backhoe
	Health and safety equipment

2.0 PROCEDURES

This SOP presents procedures for conducting test pit, surface soil, and subsurface soil sampling. The project-specific field sampling plan will specify which of the following procedures will be used.

Soil samples for chemical analysis should be collected in the following order: (1) VOCs, (2) semivolatile organic compounds, and (3) metals. Once the chemical samples have been containerized, samples for physical analyses can be containerized. Typical physical analyses conducted include (1) grain size distribution, (2) moisture content, (3) saturated permeability, (4) unsaturated permeability, and (5) Atterberg limits. Additionally, visual descriptions of samples, using the Unified Soil Classification System (USCS), should be recorded. Soil samples for chemical analyses can be collected either as grab samples or composite samples. A grab sample is collected from a discrete location or depth. A composite sample consists of soil combined from more than one discrete location. Typically, composite samples consist of soil obtained from several locations and homogenized in a stainless steel or Teflon® pan or tray. Samples for VOC analysis should not be composited.

2.1 TEST PIT SOIL SAMPLING

Test pit soil sampling is conducted when a complete soil profile is required or as a means of locating visually detectable contamination or sources, such as debris and underground storage tanks. This type of sampling provides a detailed description of the soil profile and allows for multiple samples to be collected from specific soil horizons. Before conducting any test pit or trench excavation with a backhoe, the sampling team should ensure that the sampling area is clear of utility lines, subsurface pipes, and poles. Any intrusive activities require Trust project review and permit issuance.

A test pit or trench is excavated by incrementally removing soil material with a backhoe bucket. The excavated soil may be placed on plastic sheeting (or other means of segregation), well away from the edge of the test pit. A test pit with depths greater than 4 feet must have its walls properly stabilized

according to Occupational Safety and Health Administration standards if personnel access to the pit is required. In many applications, sampling from the backhoe bucket will be preferred.

Personnel entering the test pit may be exposed to toxic or explosive gases and oxygen deficient environments. Air monitoring is required before entering the test pit and the use of appropriate respiratory gear and protective clothing is mandatory. At least two persons must be present at the test pit before sampling personnel enter the excavation and begin soil sampling.

Test pits are not practical for depths greater than 15 feet. If soil samples are required from depths greater than 15 feet, samples should be obtained using test borings instead of test pits. Test pits are also usually limited to a few feet below the water table. In some cases, a pumping system may be required to control the water level within the pits.

Access to open test pits should be restricted by use of flagging, tape, or fencing. If a fence is used, it should be erected at least 6 feet from the perimeter of the test pit. The test pit should be backfilled as soon as possible after sampling is completed.

Soil samples can be collected from the walls or bottom of a test pit using various equipment. A hand auger, bucket auger, or core sampler can be used to obtain samples from various depths. A trier, trowel, or spoons can be used to obtain samples from the walls or pit bottom surface.

2.2 SURFACE SOIL SAMPLING

The surface (and near surface) soil sampling equipment presented in this SOP is best suited for sampling to depths of 0 to 6 feet below ground surface (bgs). The sample depth, sample analyses, soil type, and soil moisture will also dictate the best-suited sampling equipment. Before sample collection, the sampling locations should be cleared of any surface debris such as twigs, rocks, and litter. The following table presents various surface soil sampling equipment and their effective depth ranges, operating means (manual or power), and sample types collected (disturbed or undisturbed).

Sampling Equipment	Effective Depth Range (feet bgs)	Operating Means	Sample Type
Hand Auger	0 to 6	Manual	Disturbed
Bucket Auger	0 to 4	Power	Disturbed
Core Sampler	0 to 4	Manual or Power	Undisturbed

Shovel	0 to 6	Manual	Disturbed
Trier	0 to 1	Manual	Disturbed
Trowel	0 to 1	Manual	Disturbed
Spoon/Spatula	0 to 0.5	Manual	Disturbed

The procedures for using these various types of sampling equipment are discussed below.

2.2.1 Hand Auger

A hand auger equipped with extensions and a T-handle is used to obtain samples from a depth of up to 6 feet below ground surface. If necessary, a shovel may be used to excavate the topsoil to reach the desired subsoil level. If topsoil is removed, its thickness should be recorded. Samples obtained using a hand auger are disturbed in their collection; determining the exact depth at which samples are obtained is difficult.

The hand auger is screwed into the soil at an angle of 45 to 90 degrees from horizontal. When the entire auger blade has penetrated soil, the auger is removed from the soil by lifting it straight up without turning it, if possible. If the desired sampling depth has not been reached, the soil is removed from the auger and deposited onto plastic sheeting. This procedure is repeated until the desired depth is reached and the soil sample is obtained. The auger is then removed from the boring and the soil sample is collected directly from the auger into an appropriate sample container.

2.2.2 Bucket Auger

A bucket auger, equipped similarly as the hand auger, is used to obtain disturbed samples from a depth of up to 4 feet. A bucket auger should be used when sampling stony or dense soil that prohibits the use of a hand-operated core or screw auger. A bucket auger with closed blades is used in soil that cannot generally be penetrated or retrieved by a core sampler.

The bucket auger is rotated while downward pressure is exerted until the bucket is full. The bucket is then removed from the boring, the collected soil is placed on plastic sheeting, and this procedure is repeated until the appropriate depth is reached and a sample is obtained. The bucket is then removed from the boring and the soil sample is transferred from the bucket to an appropriate sample container.

2.2.3 Core Sampler

A hand-operated core sampler (Figure 1), similarly equipped as the hand auger, is used to obtain samples from a depth of up to 4 feet in uncompacted soil. The core sampler is capable of retrieving undisturbed soil samples and is appropriate when low concentrations of metals or organics are of concern. The core sampler should be constructed of stainless steel. A polypropylene core sampler is generally not suitable for sampling dense soils or sampling at an appreciable depth.

The core sampler is pressed into the soil at an angle of 45 to 90 degrees from horizontal and is rotated when the desired depth is reached. The core is then removed, and the sample is placed into an appropriate sample container.

2.2.4 Shovel

A shovel may be used to obtain large quantities of soil that are not readily obtained with a trowel but is not recommended. A shovel is used when soil samples from a depth of up to 6 feet are to be collected by hand excavation; a tiling spade (sharpshooter) is recommended for excavation and sampling. A standard steel shovel may be used for excavation; either a stainless steel or polypropylene shovel may be used for sampling. Soil excavated from above the desired sampling depth should be stockpiled on plastic sheeting. Soil samples should be collected from the shovel and placed into the sample container using a stainless-steel scoop, plastic spoon, or other appropriate tool.

2.2.5 Trier

A trier (Figure 2) is used to sample soil from a depth of up to 1 foot. A trier should be made of stainless steel or polypropylene. A chrome-plated steel trier may be suitable when samples are to be analyzed for organics and heavy metal content is not a concern.

Samples are obtained by inserting the trier into soil at an angle of up to 45 degrees from horizontal. The trier is rotated to cut a core and is then pulled from the soil being sampled. The sample is then transferred to an appropriate sample container.

2.2.6 Trowel

A trowel is used to obtain surface soil samples that do not require excavation beyond a depth of 1 foot. A trowel may also be used to collect soil subsamples from profiles exposed in test pits. Use of a trowel is practical when sample volumes of approximately 1 pint (0.5 liter) or less are to be obtained. Excess soil should be placed on plastic sheeting until sampling is completed. A trowel should be made of stainless steel (or galvanized steel for samples that are analyzed for metals). It can be purchased from a hardware or garden store. Soil samples to be analyzed for organics should be collected using a stainless steel trowel. Samples may be placed directly from the trowel into sample containers.

2.3 SUBSURFACE SOIL SAMPLING

Subsurface soil sampling, in conjunction with borehole drilling, is required for soil sampling from depths greater than approximately 6 feet. Subsurface soil sampling is frequently coupled with exploratory boreholes or monitoring well installation. Refer to SOP No. 004 for monitoring well installation and borehole drilling procedures. Prior to intrusive soil sampling activities, site utilities may be required to be cleared by a qualified utility locator. As noted previously, intrusive soil activities also require Trust project review and permit issuance.

Subsurface soil sampling may be conducted using a drilling rig or power auger. Selection of sampling equipment depends upon geologic conditions and the scope of the sampling program. Two types of samplers used with machine-driven augers—the split-spoon sampler and the thin-wall tube sampler—are discussed below. All sampling tools should be cleaned before and after each use in accordance with SOP No. 014 (General Equipment Decontamination). Both the split-spoon sampler and the thin-wall tube sampler can be used to collect undisturbed samples from unconsolidated soils. Direct-push methods are commonly used to drive tube samplers equipped with acetate or brass sleeves. Acetate sleeves permit the recovery of a continuous core (typically 4-foot lengths) that can be divided for chemical or other analyses. The procedures for using the split-spoon and thin-wall tube samplers are presented below.

2.3.1 Split-Spoon Sampler

Split-spoon samplers are available in a variety of types and sizes. Site conditions and project needs (such as large sample volume for multiple analyses) determine the specific type of split-spoon sampler to be used. Figure 3 shows a generic split-spoon sampler.

The split-spoon sampler is advanced into the undisturbed soil beneath the bottom of the casing or borehole using a weighted hammer and a drill rod. The relationship between hammer weight, hammer drop, and number of blows required to advance the split-spoon sampler in 6-inch increments indicates the density or consistency of the subsurface soil. After the split-spoon sampler has been driven to its intended depth, it should be removed carefully to avoid loss of sample material. In noncohesive or saturated soil, a catcher or basket should be used to help retain the sample.

After the split-spoon sampler is removed from the casing, it is detached from the drill rod and opened. If VOC samples are to be collected, EnCore™ samplers should be filled with soil taken directly from the split-spoon sampler (see Section 2.4). Samples for other specific chemical analyses should be taken as soon as the VOC sample has been collected. The remainder of the recovered soil can then be used for visual classification of the sample and containerized for physical analysis. The entire sample (except for the top several inches of possibly disturbed material) is retained for analysis or disposal.

2.3.2 Thin-Wall Tube Sampler

A thin-wall tube sampler, sometimes called the Shelby tube (Figure 4), may be pressed or driven into soil inside a hollow-stem auger flight, wash bore casing, or uncased borehole. The tube sampler is pressed into the soil without rotation to the desired depth or until refusal. If the tube cannot be advanced by pushing, it may be necessary to drive it into the soil without rotation using a hammer and drill rod. The tube sampler is then rotated to collect the sample from the soil and removed from the borehole.

After removal of the tube sampler from the drilling equipment, the tube sampler should be inspected for adequate sample recovery. The sampling procedure should be repeated until an adequate soil core is obtained (if sample material can be retained by the tube sampler). The soil core obtained should be documented in the logbook. Any disturbed soil is removed from each end of the tube sampler. If chemical analysis is required, VOC samples must be collected immediately after the tube sampler is withdrawn (see Section 2.4). Before use, and during storage and transport, the tube sampler should be capped with a nonreactive material. For physical sampling parameters, the tube sampler should be sealed by pouring three 0.25-inch layers of sealing liquid (such as wax) in each end, allowing each layer to solidify before applying the next. The remaining space at each end of the tube is filled with Ottawa sand or other, similar sand, which is allowed to settle and compact. Plastic caps are then taped over the ends of the tube. The top and bottom of the tube sampler should be labeled and the tube sampler should be stored accordingly.

2.4 ENCORE™ SOIL SAMPLER SYSTEM FOR VOC ANALYSES

The EnCore™ soil sampler system is a dedicated system designed to collect, store, and deliver an approximately 5- or 25-gram soil sample in a zero-headspace container. The samplers are applicable to the collection of samples for VOC analyses (including chlorinated and aromatic VOCs and purgeable total petroleum hydrocarbons). No preservation chemicals are needed in the field. Extrusion and extraction of the whole sample in the sampler is done in the laboratory. No subsampling of the individual container is necessary. The EnCore™ sampler is a single use device and cannot be cleaned or reused. The EnCore™ system consists of the following four components:

- A cartridge with moveable plunger
- A cap with two locking arms
- A T-handle to aid in sampling
- An extrusion handle used in the laboratory

The soil collected in the EnCore™ sampler is stored in a sealed, headspace-free state. Three Viton "O"-rings achieve the seals (two located on the plunger and one on the cap of the sampler). For correct sealing, these O-rings must not be removed or disturbed.

The following procedures should be followed to collect a soil sample with the EnCore™ sampler:

- Before collecting the sample, hold the coring body and push the plunger rod down until small rod rests against the tabs (to ensure that the plunger moves freely). Then, depress locking lever on T-handle and place the coring body, plunger end first, into the open end of the T-handle, aligning the two slots on the coring body with the two locking pins in the T-handle. Twist the coring body clockwise to lock the pins in the slot. Check to ensure sampler is locked in place.
- Turn the T-handle such that the "T" is up and the coring body is down. This position leaves the plunger body flush with the bottom of the coring body. Holding the T-handle, push and twist the sampler into the soil until the coring body is completely full. When the sampler is full, the small O-ring on the plunger rod will be centered in the T-handle viewing hole (the upper hole for the 25-gram sampler and the lower hole for the 5-gram sampler). Remove the sampler from the soil.

- Before capping the sampler, wipe excess soil from the coring body exterior, ridge area, and any soil that may protrude beyond the opening end of the coring body to ensure proper sealing. Cap the coring body while it is still on the T-handle. Continue as above until three samples have been collected from the location. If only VOCs are to be analyzed for a given location, a small jar (minimum 2 ounce) of sample must be collected to allow for moisture content analysis.

When sampling surface soils, apply the EnCore™ sampler to a freshly exposed soil surface, following the procedures described above. When sampling subsurface soils, EnCore™ samples should be collected from one of the open ends of a sleeve core immediately upon retrieval.

The EnCore™ sampling system cannot be reliably used as stated above to sample sand, loose soil, or sediment since a cohesive plug will not be formed with these materials. When working with these soils, pull the plunger all the way back and lock it. Turn the sampler upside down and scoop the material into the coring body and cap it. Make a note of this method deviation in the field notebook.

Place the three collocated samples for each VOC analysis into one zipper bag. Seal the bag, place it into a prechilled cooler maintained at 4°C, and ship the samples to the laboratory for preservation and analysis. The recommended holding time between sampling and preservation by the laboratory is 48 hours. The recommended holding time between preservation and analysis is 14 days. The laboratory will preserve two EnCore™ containers using sodium bisulfate and one container using methanol. This allows for both low-level and high-level analysis of the sample.

FIGURE 1

HAND-OPERATED CORE SAMPLER

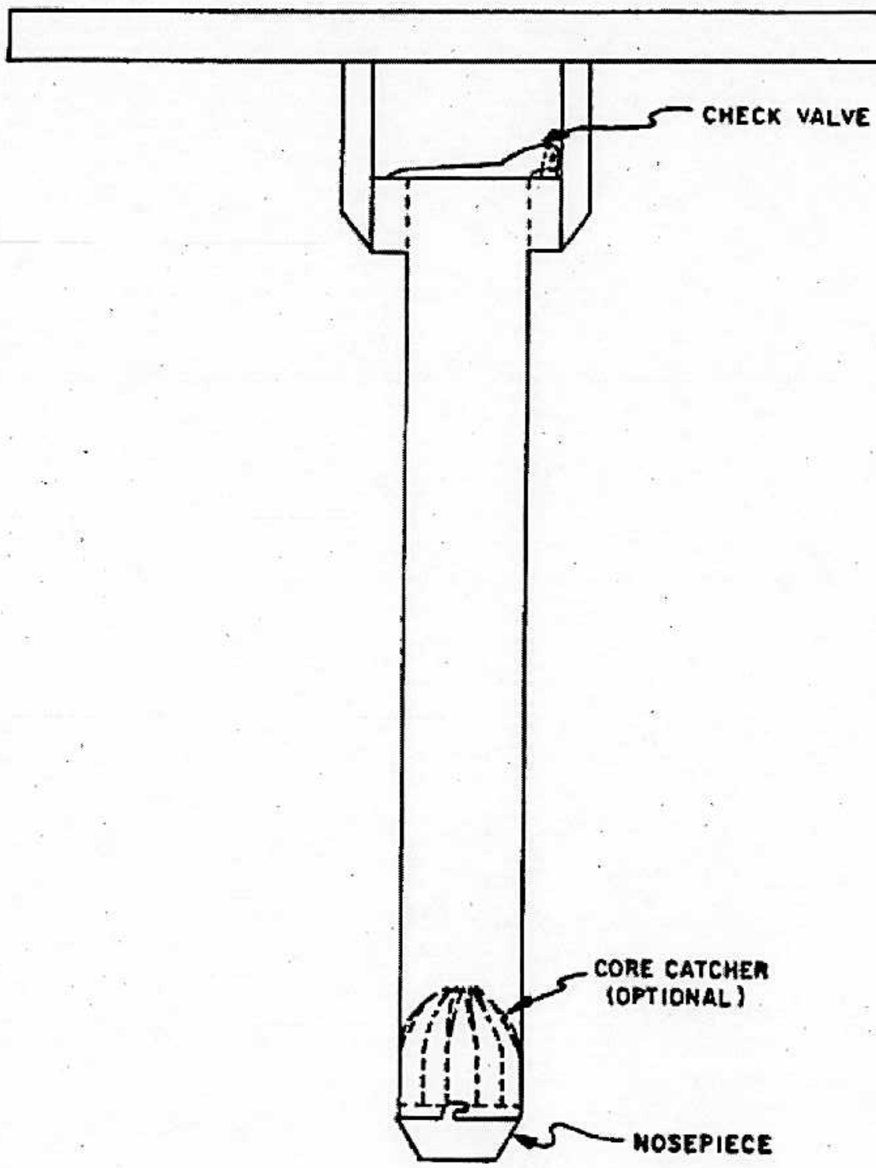


FIGURE 2

TRIER

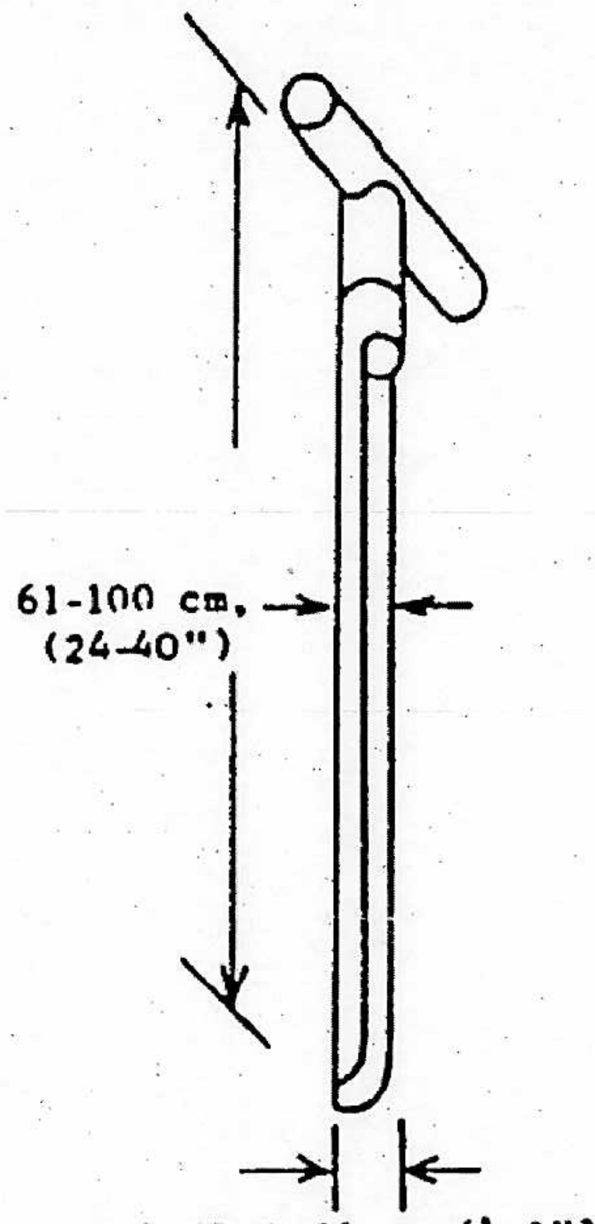


FIGURE 3

GENERIC SPLIT-SPOON SAMPLER

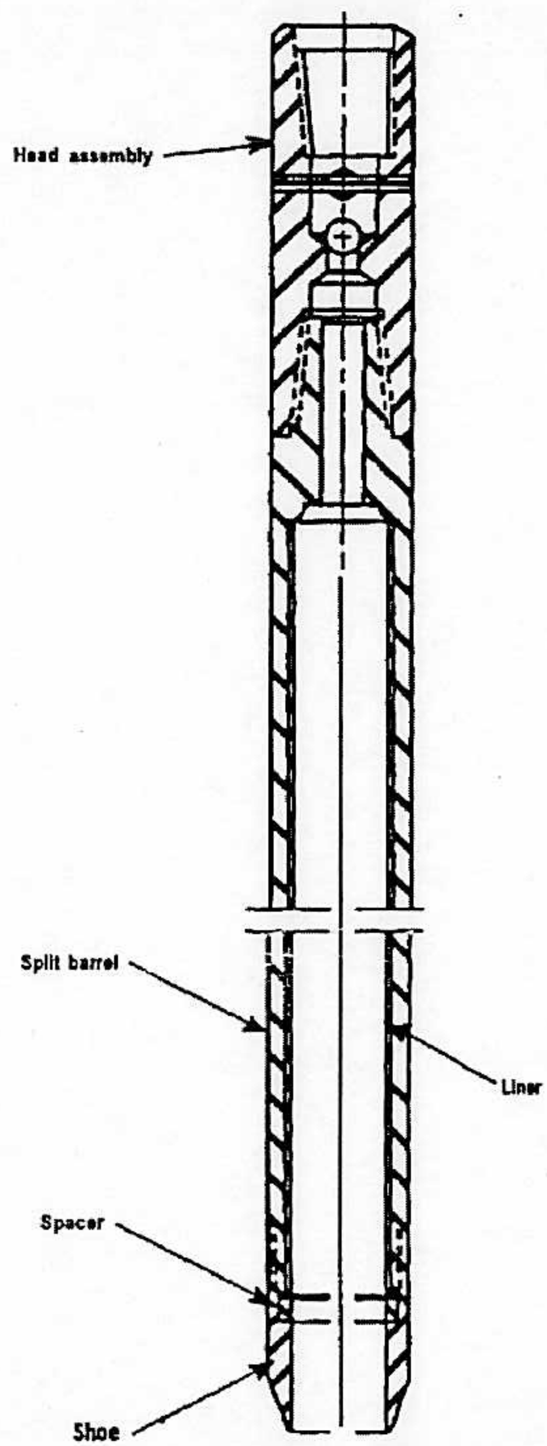
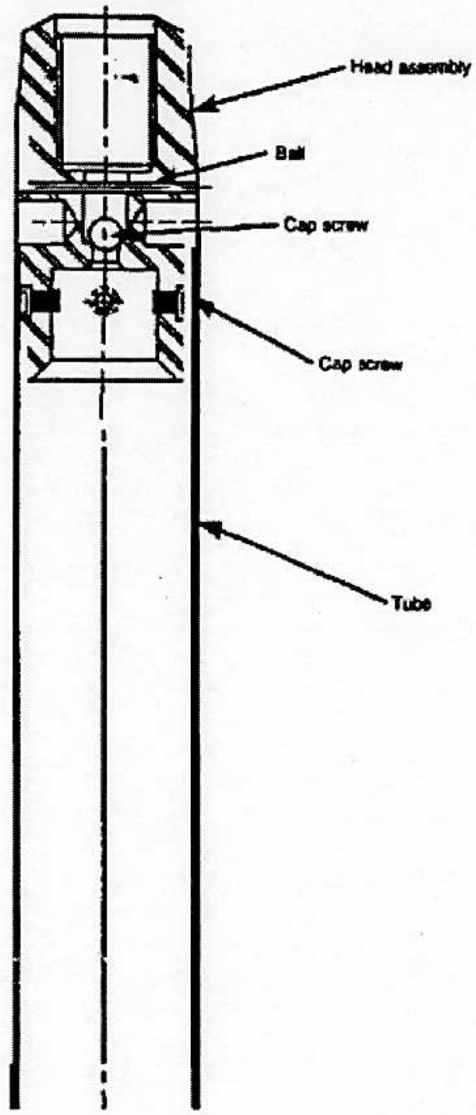


FIGURE 4

THIN-WALL TUBE SAMPLER



SOP APPROVAL FORM

THE PRESIDIO TRUST
ENVIRONMENTAL STANDARD OPERATING PROCEDURE

GROUNDWATER SAMPLING

SOP NO. 002
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1.0 BACKGROUND

Groundwater sampling is conducted where there is a need to examine the chemical composition of groundwater contaminants. Groundwater can be sampled from an exploratory boring, pit or trench but the most reliable chemical data requires sampling from a properly constructed monitoring well. Groundwater sample collection procedures, when using low flow technology, are discussed in standard operating procedure (SOP) No. 003.

1.1 PURPOSE

This SOP establishes the requirements and procedures for sampling of groundwater from a properly constructed monitoring well (refer to SOP No. 004 for well installation procedures).

1.2 SCOPE

This SOP applies to groundwater sampling activities conducted in the field.

1.3 DEFINITIONS

Bailer: A cylindrical sampling device with valves on either end used to extract water from a well. Bailers are usually constructed of an inert material such as stainless steel or polytetrafluoroethylene (Teflon®). The bailer is lowered and raised by means of a disposable rope or a cable that may be cleaned and reused.

Electrical Water Level Indicator: An electrical device that has a light or sound alarm connected to an open circuit used to determine the depth to fluid. The circuit is closed when the probe intersects a conducting fluid. The wire used to raise and lower the probe is usually graduated in feet and inches.

Immiscible Phase: Liquid phases (such as oils) that cannot be uniformly mixed or blended with water. Heavy immiscible phases sink, and light immiscible phases float on water.

Interface Probe: An electrical probe that determines the distance from the surface to air/water, air/immiscible liquid, or immiscible liquid/water interfaces.

Purge Volume: The volume of water that needs to be removed from the well to ensure that a sample representative of groundwater is taken.

Riser Pipe: The length of well casing above the ground surface.

Total Well Depth: The distance from the ground surface to the bottom of the well.

Water Level: The level of water in a well. Measured as depth to water or as elevation of water, relative to a reference mark or datum (typically a permanent mark etched on the top of the inner casing.

1.4 REFERENCES

U.S. Department of Energy. 1985. *Procedures for the Collection and Preservation of Groundwater and Surface Water Samples and for the Installation of Monitoring Wells: Second Edition.* N. Korte and P. Kearl (Editors). Technical Measurements Center, Grand Junction Projects Office. GJ/TMC-08.

U.S. Environmental Protection Agency (EPA). 1982. *Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities.* EPA-530/SW-611. August.

EPA. 1984. "Sampling at Hazardous Materials Incidents." EPA Hazardous Response Support Division, Cincinnati. 1984.

U.S. Geological Survey. 1984. *National Handbook of Recommended Methods for Water-Data Acquisition.* Reston, Virginia.

1.5 REQUIREMENTS AND RESOURCES

There are various options available to obtain groundwater samples. The procedures are outlined in the following section. The equipment needed to accomplish these procedures includes the following:

- Organic vapor detector with a flame ionization detector (FID) or a photoionization detector (PID)
- Pipe wrench
- Electrical water level indicator or interface probe
- Steel tape with heavy weight
- Purging device (type needed depends on well depth, casing diameter, type of sample desired - see sampling devices below)
- Sampling device (type needed depends upon depth to water and type of sample desired)
  - Bailer
  - Bladder pump

  - Submersible (non-oil-bearing) pump
  - Existing dedicated equipment
  - Peristaltic pump
  - Tubing

- Sample containers
- Wastewater containers
- Field logbook
- Stopwatch

Additional equipment is required to complete measurement of field parameters (for example, pH, specific conductance, and temperature) of the groundwater at the well.

2.0 PROCEDURES

Prior to sampling, a project-specific field sampling plan should be developed. The plan should take into consideration the site characteristics and should include:

- The specific repeatable water level measurement techniques and reference points for determining the depth to water and the depth to the bottom of the well
- The specific method of purging and selection of purging equipment
- The specific analytic method for measurements of field parameters and the selection of field analytical equipment
- The specific method of sample collection and selection of sampling equipment
- The order of sample bottle filling
- The sample chemical analytical parameters

The following sections discuss procedures for approaching the well, establishing a sample preparation area, preliminary well measurements, purging the well, and sample collection.

2.1 APPROACHING THE WELL

In general, all wells should be assumed to pose a health and safety risk until field measurements indicate otherwise. Approach wells from the upwind side. Record well appearance and general condition of the protective casing, surface seal, and surrounding area in the logbook.

Once at the well, the lead person should systematically use the organic vapor detector to survey the immediate area around the well (from the breathing zone to the top of the casing to the ground). If elevated FID and PID meter readings are encountered, retreat to a safe area and instruct the sampling team to put on the appropriate level of personal protective equipment (PPE).

Upon opening the well casing, the lead person should systematically survey inside the well casing, above the well casing in the breathing zone and the immediate area around the well. If elevated FID or PID meter readings in the breathing zone are encountered (see health and safety plan for action levels), retreat and put on appropriate PPE. It is important to remember that action levels are based on readings in the breathing zone, not within the well casing. Representative organic vapor detector readings will be recorded in the logbook.

2.2 ESTABLISHING A SAMPLE PREPARATION AREA

The sample preparation area is generally located upwind or to either side of the well. If elevated readings are encountered using an organic vapor detector, this area should be taped off and the sample preparation area should be located upwind, where ambient readings are found.

2.3 PRELIMINARY WELL MEASUREMENTS

Several preliminary well measurements should be made prior to initiating sampling of the well. These include determining water level and total well depth measurements, determining the presence of immiscible phases, and calculating purge volumes. All preliminary measurements will be recorded in the logbook, as they are determined.

2.3.1 Water Level and Total Well Depth Measurements

Water level measurements are to be made using an electric water-level indicator. This device sounds an alarm or illuminates a light when the measuring probe touches the water surface, thus closing an electrical circuit. The electric cable supporting the probe is usually graduated in decimal feet and can be read at the

well site directly. Water levels should be read to a precision of 0.01 foot. The distance between the static water level and the marked or notched location at the top of the riser pipe is measured. The height of the riser pipe above ground surface, as obtained from well location survey data, is then subtracted from the total reading to give the depth to static water. To improve the accuracy of the readings, each measurement should be for a series of three readings, and the values averaged. This helps to eliminate any gross measurement errors or errors due to kinks or bends in the wires, which may change the length when the device is raised and lowered.

The total well depth can be measured by using a steel tape with a heavy weight attached to the end. The tape is lowered into the well until resistance is met, indicating that the weight has reached the bottom of the well. The total well depth is then read directly from the steel tape to the 0.01-foot fraction. The distance between the bottom of the well and the marked or notched location on the riser pipe is measured. The height of the riser pipe above the ground surface, as obtained from well survey data, is then subtracted from the total reading to give the depth to the bottom of the well. To improve the accuracy of the readings, the weighted steel tape should be used to make a series of three readings, and the readings averaged.

2.3.2 Determining if Immiscible Phases are Present

If immiscible phase liquids are observed during the measurement of water level depth and well depth, additional measurements shall be taken to determine the product thickness. Organic liquids are measured by lowering an interface probe slowly to the surface of the liquid in the well. When the audible alarm sounds, record the depth. If the alarm is continuous, a floating immiscible layer has been detected. To determine the thickness of this layer, continue lowering the probe until the alarm changes to an oscillating signal. The oscillating signal indicates that the probe has detected an aqueous layer. Record this depth as the depth to water and determine the thickness and the volume of the immiscible layer.

Continue lowering the probe into the well to determine if immiscible dense phases (sinkers) are present. If the alarm signal changes from oscillating to a continuous sound, a heavier immiscible layer has been detected; record this depth.

Continue lowering the probe to the bottom of the well and record the total depth. Separate total depth measurements with a steel tape are not necessary when using an interface probe. Calculate and record the sinker phase volume and total water volume in the well. Table 1 is provided to assist in these calculations. If immiscible phases are present, immediately refer to Section 2.5.1 or 2.5.2 of this SOP.

TABLE 1

LIQUID VOLUME IN A 1-FOOT SECTION OF A WELL BORING

Well Borehole Diameter (D_1) (inches)	Well Casing Diameter (D_2) (inches)	Volume of Liquid in 1-Foot Well Section (gallons)
7	2	0.71
8	2	0.90
10	4	1.68
12	4	2.22

2.3.3 Determination of Purging Volume

If the presence of organic liquids does not need to be determined, determine the depth to water and the total depth of the well as described in Section 2.3.1. Once these measurements have been made and recorded, use Table 1 to calculate the total volume of water in the well. In Table 1, the volume of water in a 1-foot section of a 2-inch-diameter well (8-inch borehole) is 0.90 gallon. This chart can easily be used for any water depth by multiplying the appropriate value in Table 1 by the depth (in feet) of water in the well. This volume is then multiplied by the purging factor to determine purging volume. The minimum purging factor is three borehole volumes but may be superseded by site-specific program requirements, individual well yield characteristics, or stabilization of field parameters measured during purging. Field parameters (for example, pH, specific conductance, and temperature) should be measured before purging and after each well volume. All field parameter data are recorded in the field logbook or field data form.

The volume of water to be purged is based on the following formulae:

$$V = [(AV \times n) + CV] \times L \times CF \times PF$$

$$AV = \frac{\pi}{4} \times (D_1^2 - D_2^2)/144$$

$$CV = \frac{\pi}{4} \times (D_2^2)/144$$

where:

V	=	volume of water in the well (gallons)
AV	=	annular volume (cubic-feet per foot)
CV	=	casing volume (cubic-feet per foot)
D_1	=	borehole diameter (inches)
D_2	=	well casing diameter (inches)
L	=	depth of water in the well (feet)
n	=	porosity of filter pack (assumed to be 0.30)
CF	=	conversion factor of 7.48 (gallons per cubic-foot)
PF	=	purging factor (generally a minimum of 3.00)

Note that temporary wells with no filter pack should use the casing volume times the purging factor to calculate the required purge volume.

2.4 PURGING THE WELL

Representative groundwater samples require that wells are purged prior to sampling. There are two acceptable purging methods, (1) three well volume purging and (2) low-flow purging (refer to SOP No. 003 for the low-flow methods). Well purging can be achieved using a variety of options including:

1. Bailers
2. Bladder pumps
3. Submersible (non-oil-bearing) pumps
4. Existing dedicated equipment, if any
5. Peristaltic pumps

As previously stated, the established minimum purging volume is three borehole volumes. The exception to this standard is in the case of low-yield wells. When purging low-yield wells, purge the well once to dryness. Samples should be collected as soon as the well recovers. When the time required for full recovery exceeds 3 hours, samples should be collected as soon as sufficient volume is available.

The well should be purged until the measured field parameters have been stabilized. If any field parameter has not stabilized, additional purging should be performed. To be considered stable, field parameters should change by no more than the tolerance levels listed on Table 2 between each well volume purged.

TABLE 2

FIELD MEASUREMENT TOLERANCE LEVELS

Field Parameter	Tolerance Level
pH	0.1 pH unit
Specific Conductance	10 percent
Temperature	1 °C

At no time should the purging rate be high enough to cause the groundwater to cascade back into the well, resulting in excessive aeration and potential stripping of volatile constituents.

The actual volume of purged water can be measured using several acceptable methods:

- When bailers are used, the actual volume of each bailer's contents can be measured using a calibrated bucket.
- If a pump is used for purging, the pump rate can be determined by using a bucket of known volume, stopwatch, and the duration of pumping time necessary to purge the known volume.

2.5 SAMPLE COLLECTION

The technique used to withdraw a groundwater sample from a well should be selected based on the parameters for which the sample will be analyzed. To ensure that the groundwater samples are representative, it is important to avoid physically altering or chemically contaminating the sample during collection, withdrawal, or containerization. If the samples are to be analyzed for volatile organic compounds, it is critical that air does not become entrained in the water column.

Acceptable sampling devices for all parameters are double check valve stainless steel or Teflon® bailers, bladder pumps, low-flow positive displacement pumps, or for shallow wells, peristaltic pumps. Additional measurements of field parameters should be performed at the time of sampling.

In some cases, it may become necessary to use dedicated equipment already in the well to collect samples. This is particularly true of high volume, deep wells (greater than 150 feet) where bladder pumps are ineffective and bailing is impractical. If existing equipment must be used, however, determine the make and model of the pump and obtain information on component construction materials from the manufacturer or facility representatives. If an existing pump is to be used for sampling, make sure the flow volume can be reduced so that a reliable sample for volatile organic compounds (VOC) analysis can be taken. Record the specific port, tap, or valve from which the sample is collected.

General sampling procedures include the following:

- Clean sampling equipment should not be placed directly on the ground. Use a plastic drop cloth or feed line from clean reels. Never place contaminated lines back on reels.
- Check the operation of the bailer check valve assemblies to confirm free operation.
- If the bailer cable is to be decontaminated and reused, it must be made of Teflon®-coated stainless steel.
- Lower sampling equipment slowly into the well to avoid degassing the water and damaging the equipment.
- Pump flow rates should be adjusted to eliminate intermittent or pulsed flow. The settings should be determined during the purging operations.
- A separate sample volume should be collected to measure necessary field parameters. Samples should be collected and containerized in the order of the parameters' volatilization sensitivity. Table 3 lists the preferred collection order for some common groundwater parameters.

TABLE 3

ORDER OF PREFERRED SAMPLE COLLECTION

1. VOC
2. Purgeable organic halogens (POX)
3. Total organic halogens (TOX)
4. Cyanide
5. Extractable organics
6. Purgeable organic carbon (POC)
7. Total metals
8. Dissolved metals
9. Total organic carbon (TOC)
10. Phenols
11. Sulfate and chloride
12. Nitrate and ammonia
13. Radionuclides

Intermediate containers should never be used to prepare VOC samples and should be avoided for all parameters in general. All VOC containers should be filled at a single sampling point or from a single bailer volume.

2.5.1 Collection of Light Immiscible Floaters

The approach used when collecting floaters is dependent on the depth to the floating layer and the thickness of that layer. If the thickness of the floater is 2 feet or greater, a bottom-filling valve bailer should be used. Slowly lower the bailer until contact is made with the floater surface, and lower the bailer to a depth less than that of the floater/water interface depth as determined by preliminary measurements with the interface probe.

When the thickness of the floating layer is less than 2 feet, and the depth to the surface of the floating layer is less than 15 feet, a peristaltic pump with tubing can be used to extract a sample.

When the thickness of the floating layer, however, is less than 2 feet and the depth to the surface of the floating layer is beyond the effective "lift" of a peristaltic pump (greater than 25 feet), a bailer can be modified to allow filling from the top only (an acceptable alternative is to use a top-loading Teflon® or stainless-steel bailer). Disassemble the bailer's bottom check valve and insert a piece of 2-inch diameter Teflon® sheet between the ball and ball seat. This will seal off the bottom valve. Remove the ball from the top check valve, thus allowing the sample to enter from the top. To overcome buoyancy when the bailer is lowered into the floater, place a length of one-inch stainless steel pipe on the retrieval line above the bailer (this pipe may have to be notched to allow sample entry if the pipe remains within the top of the bailer). Or, as an alternative, use a top-loading stainless-steel bailer. Lower the device, carefully measuring the depth to the surface of the floating layer, until the top of the bailer is level with the top of the floating layer. Lower the bailer an additional one-half thickness of the floating layer and collect the sample. This technique is the most effective method of collection if the floating layer is only a few inches thick. Note that immiscible layers must be collected before any purging activities.

2.5.2 Collection of Heavy Immiscible Sinkers

The best method for collection of sinkers is use of a double check valve bailer. The key to collection is controlled, slow lowering and raising of the bailer to and from the bottom of the well. Collection methods are equivalent to those described in Section 2.5.1 above.

2.5.3 Collection of Volatile Organics Samples

This section discussesin detail the collection of samples for VOC analysis using either a bailer or bladder pump. Other pumps (such as positive displacement or peristaltic) can be used. Critical factors to the collection of representative VOC samples include ensuring that no air becomes entrained in the water column, maintaining low pump flow rates (less than 100 milliliter [mL] per minute, if possible), and avoiding flow surges.

2.5.3.1 Collection with Bailers

VOC samples should be collected from the first bailer removed from the well after purging. The most effective approach requires two people. One person should retrieve the bailer from the well and pour its contents into the appropriate number of 40-mL VOC vials, which are held by the second person. Each vial is then capped and inverted. If the sample vial has a bubble, unscrew the cap and add more water, or discard and repeat. The sample is transferred from the bailer to the sample container in a manner to limit the amount of agitation and reduce the loss of volatile organics from the sample. Always fill VOC vials from a single bailer volume. If the bailer is refilled, samples cannot be considered duplicates or splits.

2.5.3.2 Collection with a Bladder Pump

To successfully perform VOC sampling with a bladder pump, the following steps must be completed:

1. Following manufacturer's directions, activate the pump. Full water flow from the discharge tubing will begin after 5 to 15 pumping cycles. These initial pumping cycles are required to purge air from the pump and discharge tubing. The discharge and recharge settings must be manually set and adjusted to pump at optimum flow rates. To activate the bladder, it is best to set the initial cycle at long discharge and recharge rates.

2. Reduce the water flow rate for VOC sample collection. To reduce the water flow rate, turn the throttle control valve (located on the left side of the pump control panel) counterclockwise.

3. Collect a VOC sample from discharge tubing. VOC vials must be placed beneath the discharge tubing while avoiding direct contact between the vials and the tubing. <u>Never</u> place tubing past the mouth of the VOC vial. The pump throttle control must be turned as necessary to maintain a trickle of water in order to obtain a meniscus in the vial.

4. Continue with non-VOC sampling. Increase pump flow rate by turning the throttle control knob clockwise.

ATTACHMENT A

MONITORING WELL SAMPLING LOG

MONITORING WELL SAMPLING LOG

THE PRESIDIO TRUST

Well No.: MWO No.:________ Day/Date:______________

Site/Project Name:____

Organic Vapor Concentrations Top of Casing:______ppm Breathing Zone______ppm

Depth to bottom: [ ] ft. below top of casing

Depth to water: [ ] ft. below top of casing

Initial D.O. Readings

Position in Screened Interval

Top: ______mg/L

Middle: ______mg/L

Bottom: ______mg/L

		Water Column		Purge Volume	
[ ]	2-inch well	[ ]	ft. x 0.163 gal/ft x 3 =	[ ]	gal.
[ ]	4-inch well	[ ]	ft. x 0.652 gal/ft x 3 =	[ ]	gal.
[ ]	_-inch well	[ ]	ft. x _____ gal/ft x 3 =	[ ]	gal.

Method of Extraction: [ ] Disposable Bailer [ ] Other:________________

Groundwater Parameters

Time	Volume Purged (gal.)	Temp. (°C)	Specific Conductivity (mS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	pH	Turbidity (NTU)	Other

Purged Dry? [ ] Field measurement equipment used:________________________________

Groundwater Samples Collected

Analytes of Concern			**Fate and Transport Data**				
Off-Site Lab			*Off-Site Lab*		*Field Test Kit Analyses*		
Metals	[ ]	-Filtered	Anions	[ ]	Alkalinity	[ ]	
PCBs	[ ]		M/E/E	[ ]	Fe^{2+}	[ ]	F-y/n [ ]
SVOCs	[ ]		Sulfide	[ ]	Mn^{2+}	[ ]	F-y/n [ ]
TPH-e	[ ]		TDS	[ ]			
TPH-p	[ ]		VOCs	[ ]	F-y/n= note (yes/no) filtered samples.		
VOCs	[ ]				Filter where turbidity > 100 NTU.		

Sampler(s):____

Sample Number(s):______________________ Sample Date/Time:__________________

Sample Collection Method: [ ] Disposable Bailer [ ] Other:

QA/QC Sample(s)? [ ] None [ ] Field Duplicate [ ] MS/MSD

Dup. Sample Number:______________________ Dup. Sample Date/Time:______________

Comments:

Sheet ___ of ___

1.0 BACKGROUND

All nondisposable field equipment must be decontaminated before and after each use at each sampling location to obtain representative samples and to reduce the possibility of cross-contamination.

1.1 PURPOSE

This standard operating procedure (SOP) establishes the requirements and procedures for decontaminating equipment in the field.

1.2 SCOPE

This SOP applies to decontaminating general nondisposable field equipment. To prevent contamination of samples, all sampling equipment must be thoroughly cleaned prior to each use.

1.3 DEFINITIONS

Nonphosphate soap: Alconox® and Liquinox® are common laboratory grade products

1.4 REFERENCES

U.S. Environmental Protection Agency (EPA). 1992. "RCRA Groundwater Monitoring: Draft Technical Guidance." Office of Solid Waste and Emergency Response. Washington, DC. EPA/530-R-93-001. November.

EPA. 1994. "Sampling Equipment Decontamination." Environmental Response Team SOP No. 2006. Revision No. 0.0. August 11. (On-Line Address: http://www.ert.org/media_resrcs/media_resrcs.asp.)

1.5 REQUIREMENTS AND RESOURCES

The equipment required to conduct decontamination is as follows:

- Scrub brushes
- Large wash tubs or buckets
- Squirt bottles
- Nonphosphate soap
- Tap water

- Distilled water
- Plastic sheeting
- Aluminum foil
- Methanol or hexane
- Dilute (0.1 N) nitric acid
- Steam cleaner

2.0 PROCEDURES

The procedures below discuss decontamination of personal protective equipment (PPE), drilling and monitoring well installation equipment, borehole soil sampling equipment, water-level measurement equipment, and general sampling equipment.

2.1 PERSONAL PROTECTIVE EQUIPMENT DECONTAMINATION

Personnel working in the field are required to follow specific procedures for decontamination prior to leaving the work area so that contamination is not spread off-site or to clean areas. All used disposable protective clothing, such as Tyvek® coveralls, gloves, and booties, will be containerized for later disposal. Decontamination water will be containerized in 55-gallon drums.

Personnel decontamination procedures will be as follows:

1. Wash neoprene boots (or neoprene boots with disposable booties) with Liquinox or Alconox solution and rinse with clean water. Remove booties and retain boots for subsequent reuse.

2. Wash outer gloves in Liquinox® or Alconox® solution and rinse in clean water. Remove outer gloves and place into plastic bag for disposal.

3. Remove Tyvek® or coveralls. Containerize Tyvek® for disposal and place coveralls in plastic bag for reuse.

4. Remove air purifying respirator (APR), if used, and place the spent filters into a plastic bag for disposal. Filters should be changed daily or sooner depending on use and application. Place respirator into a separate plastic bag after cleaning and disinfecting.

5. Remove disposable gloves and place them in plastic bag for disposal.

6. Thoroughly wash hands and face in clean water and soap.

2.2 DRILLING AND MONITORING WELL INSTALLATION EQUIPMENT DECONTAMINATION

All drilling equipment should be decontaminated before drilling operations begin, between borings, and at completion of the project. The locations for decontamination activities will be designated by the Trust project manager.

Monitoring well casing, screens, and fittings are assumed to be delivered to the site in a clean condition. However, they should be steam cleaned on-site prior to placement downhole. The drilling subcontractor will typically furnish the steam cleaner and water.

After cleaning the drilling equipment, field personnel should place the drilling equipment, well casing and screens, and any other equipment that will go into the hole on clean polyethylene sheeting. The drilling auger, bits, drill pipe, temporary casing, surface casing, and other equipment should be decontaminated by the drilling subcontractor by hosing down with a steam cleaner until thoroughly clean. Drill bits and tools that still exhibit particles of soil after the first washing should be scrubbed with a wire brush and then rinsed again with a high-pressure steam rinse.

All wastewater from decontamination procedures should be containerized.

2.3 BOREHOLE SOIL SAMPLING EQUIPMENT DECONTAMINATION

The soil sampling equipment should be decontaminated after each sample as follows:

1. Prior to sampling, scrub the split-barrel sampler and sampling tools in a bucket, containing Liquinox® or Alconox® solution, using a stiff, long bristle brush.
2. Steam clean the sampling equipment over the rinsate tub and allow to air dry or rinse with deionized (distilled) water.
3. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
4. Containerize all water and rinsate.
5. Decontaminate all pipe placed down the hole as described for drilling equipment.

2.4 WATER-LEVEL MEASUREMENT EQUIPMENT DECONTAMINATION

Field personnel should decontaminate the well sounder and interface probe before inserting and after removing them from each well. The following decontamination procedures should be used:

1. Wipe the sounding cable with a disposable soap-impregnated cloth or paper towel.
2. Rinse with deionized (distilled) organic-free water.

2.5 GENERAL SAMPLING EQUIPMENT DECONTAMINATION

All nondisposable sampling equipment should be decontaminated using the following procedures:

1. Select an area removed from sampling locations that is both downwind and downgradient. Decontamination must not cause cross-contamination between sampling points.
2. Maintain the same level of protection as was used for sampling.
3. If a steam cleaner is not available, to decontaminate a piece of equipment, use an Alconox® wash; a tap water wash; a solvent (methanol or hexane) rinse, if applicable or dilute (0.1 N) nitric acid rinse, if applicable; a distilled water rinse; and air drying. Use a solvent (methanol or hexane) rinse for grossly contaminated equipment (for example, equipment that is not readily cleaned by the Alconox® wash). The dilute nitric acid rinse may be used if metals are the analyte of concern.
4. Place cleaned equipment in a clean area on plastic sheeting and wrap with aluminum foil.
5. Containerize all water and rinsate.

1.0 BACKGROUND

In any sampling program, the integrity of a sample must be ensured from its point of collection to its final disposition. Procedures for classifying, packaging, and shipping samples are described below. Steps in the procedures should be followed to ensure sample integrity and to protect the welfare of persons involved in shipping and receiving samples. When hazardous substances and dangerous goods are sent by common carrier, their packaging, labeling, and shipping are regulated by the U.S. Department of Transportation (DOT) Hazardous Materials Regulations (HMR) (*Code of Federal Regulations*, Title 49 [49 CFR] Parts 106 through 180) and the International Air Transportation Association (IATA) Dangerous Goods Regulations (DGR).

1.1 PURPOSE

This standard operating procedure (SOP) establishes the requirements and procedures for packaging and shipping samples. It has been prepared in accordance with the U.S. Environmental Protection Agency (EPA) "Sampler's Guide to the Contract Laboratory Program (CLP)," the DGR, and the HMR. Sample packaging and shipping procedures described in this SOP should be followed for all sample packaging and shipping. Deviations from the procedures in this SOP must be documented in a field logbook. This SOP assumes that samples are already collected in the appropriate sample jars and that the sample jars are labeled and tagged appropriately.

1.2 SCOPE

This SOP applies to sample classification, packaging, and shipping.

1.3 DEFINITIONS

Chain of Custody: Document indicating custody of the samples at all times between sampling and analysis.

Custody Seal: A custody seal is a tape-like seal. Placement of the custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been packaged for shipping.

Dangerous Goods: Dangerous goods are articles or substances that can pose a significant risk to health, safety, or property when transported by air; they are classified as defined in Section 3 of the DGR (IATA 1999).

Environmental Samples: Environmental samples include drinking water, groundwater and surface water, soil, sediment, treated municipal and industrial wastewater effluent, and biological specimens. Environmental samples typically contain low concentrations of contaminants and when handled require only limited precautionary procedures.

Hazardous Materials Regulations: The HMRs are DOT regulations for the shipment of hazardous materials by air, water, and land; they are located in 49 CFR 106 through 180.

Hazardous Samples: Hazardous samples include dangerous goods and hazardous substances. Hazardous samples shipped by air should be packaged and labeled in accordance with procedures specified by the DGR; ground shipments should be packaged and labeled in accordance with the HMR.

Hazardous Substance: A hazardous substance is any material, including its mixtures and solutions, that is listed in Appendix A of 49 CFR 172.101 and its quantity, in one package, equals or exceeds the reportable quantity (RQ) listed in the appendix.

IATA Dangerous Goods Regulations: The DGRs are regulations that govern the international transport of dangerous goods by air. The DGRs are based on the International Civil Aviation Organization (ICAO) Technical Instructions. The DGR contain all of the requirements of the ICAO Technical Instructions and are more restrictive in some instances.

Nonhazardous Samples: Nonhazardous samples are those samples that do not meet the definition of a hazardous sample and **do not** need to be packaged and shipped in accordance with the DGR or HMR.

Overpack: An enclosure used by a single shipper to contain one or more packages and to form one handling unit (IATA 1999). For example, a cardboard box may be used to contain three fiberboard boxes to make handling easier and to save on shipping costs.

1.4 REFERENCES

U.S. Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico (DOT and others). 1996. *1996 North American Emergency Response Guidebook.*

International Air Transport Association (IATA). 1997. *Guidelines for Instructors of Dangerous Courses.*

IATA. 1999. *Dangerous Goods Regulations.* 40th Edition.

U.S. Environmental Protection Agency. 1994. "Sampler's Guide to the Contract Laboratory Program." Office of Solid Waste and Emergency Response. Washington, DC. EPA/540/R-96/032. On-Line Address: http://www.epa.gov/oerrpage/superfund/programs/clp/guidance.htm - sample

1.5 REQUIREMENTS AND RESOURCES

The procedures for packaging and shipping **nonhazardous** samples require the following:

- Coolers
- Ice
- Vermiculite, bubble wrap, or similar cushioning material
- Chain-of-custody forms and seals
- Airbills
- Resealable plastic bags for sample jars and ice
- Tape (strapping and clear)

The procedures for packaging and shipping **hazardous** samples require the following:

- Ice
- Vermiculite or other noncombustible, absorbent packing material
- Chain-of-custody forms and seals
- Appropriate dangerous goods airbills and emergency response information to attach to the airbill
- Resealable plastic bags for sample jars and ice

- Tape (strapping and clear)
- Appropriate shipping containers, as specified in the DGR
- Labels that apply to the shipment such as hazard labels, address labels, "Cargo Aircraft Only" labels, and package orientation labels (up arrows)

2.0 PROCEDURES

The following procedures apply to packing and shipping nonhazardous and hazardous samples.

2.1 SAMPLE CLASSIFICATION

Prior to sample shipment by air courier, it must be determined whether the sample is subject to the DGR. Samples subject to these regulations shall be referred to as hazardous samples. Any airline belonging to IATA must follow the DGR. As a result, these air carriers **may not** accept a shipment that is packaged and labeled in accordance with the HMR (although in most cases, the packaging and labeling would be the same for either set of regulations). The HMR states that a hazardous material may be transported by aircraft in accordance with the ICAO Technical Instruction (49 CFR 171.11) upon which the DGR is based. Therefore, the use of the DGR for samples to be shipped by air complies with the HMR, but not vice versa.

Most environmental samples are not hazardous samples and do not need to be packaged in accordance with any regulations. Hazardous samples are those samples that can be classified as specified in Section 3 of the DGR, can be found in the List of Dangerous Goods in the DGR in bold type, are considered a hazardous substance (see definition), or are mentioned in "Section 2 - Limitations" of the DGR for countries of transport or airlines (such as FedEx). The hazard classifications specified in the DGR (and the HMR) are as follows:

Class 1 – Explosives

Division 1.1 – Articles and substances having a mass explosion hazard
Division 1.2 – Articles and substances having a projection hazard but not a mass explosion hazard
Division 1.3 – Articles and substances having a fire hazard, a minor blast hazard, and/or a minor projection hazard but not a mass explosion hazard
Division 1.4 – Articles and substances presenting no significant hazard
Division 1.5 – Very sensitive substances mass explosion hazard

Division 1.6 – Extremely insensitive articles, which do not have a mass explosion hazard

Class 2 – Gases

Division 2.1 – Flammable gas
Division 2.2 – Nonflammable, nontoxic gas
Division 2.3 – Toxic gas

Class 3 – Flammable Liquids

Class 4 – Flammable Solids; Substances Liable to Spontaneous Combustion; Substances, when in Contact with Water, Emit Flammable Gases

Division 4.1 – Flammable solids
Division 4.2 – Substances liable to spontaneous combustion
Division 4.3 – Substances, when in contact with water, emit flammable gases

Class 5 – Oxidizing Substances and Organic Peroxide

Division 5.1 – Oxidizers
Division 5.2 – Organic peroxides

Class 6 – Toxic and Infectious Substances

Division 6.1 – Toxic substances
Division 6.2 – Infectious substances

Class 7 – Radioactive Material

Class 8 – Corrosives

Class 9 – Miscellaneous Dangerous Goods

The criteria for each of the first eight classes are very specific and are outlined in Section 3 of the DGR and 49 CFR 173 of the HMR. Some classes and divisions are further divided into packing groups based on their level of danger. Packing group I indicates a great danger, packing group II indicates a medium danger, and packing group III indicates a minor danger. Class 2, gases, includes any compressed gas being shipped and any noncompressed gas that is either flammable or toxic. A compressed gas is defined as having a pressure over 40 pounds per square inch (psi) absolute (25 psi gauge). Most air samples and empty cylinders that did not contain a flammable or toxic gas are exempt from the regulations. An empty hydrogen cylinder, as in a flame ionization detector (FID), is considered a dangerous good unless it is properly purged with nitrogen in accordance with the HMR. A landfill gas sample is usually considered a

flammable gas because it may contain a high percentage of methane. Class 3, flammable liquids, are based on the boiling point and flash point of a substance. Most class 3 samples include solvents, oil, gas, or paint-related material collected from drums, tanks, or pits. Division 6.1, toxic substances, is based on oral toxicity (LD_{50} [lethal dose that kills 50 percent of the test animals]), dermal toxicity (LD_{50} values), and inhalation toxicity (LC_{50} [lethal concentration that kills 50 percent of the test animals] values). Division 6.1 substances include pesticides and cyanide. Class 7, radioactive material, is defined as any article or substance with a specific activity greater than 70 kiloBecquerels (kBq/kg) (0.002 [microCuries per gram [μCi/g]). If the specific activity exceeds this level, the sample should be shipped in accordance with Section 10 of the DGR. Class 8, corrosives, is based on the rate at which a substance destroys skin tissue or corrodes steel; they are not based on pH. Class 8 materials include the concentrated acids used to preserve water samples. Preserved water samples are not considered class 8 substances and should be packaged as nonhazardous samples. Class 9, miscellaneous dangerous goods, is substances that present a danger, but are not covered by any other hazard class. Examples of class 9 substances include asbestos, polychlorinated biphenyls (PCB), and dry ice.

Unlike the DGR, the HMR includes combustible liquids in hazard class 3. The definition of a combustible liquid is specified in 49 CFR 173.120 of the HMR. The HMR has an additional class, ORM-D, which is not specified in the DGR. "ORM-D material" refers to a material such as a consumer commodity, which although otherwise subject to the HMR, presents a limited hazard during transport due to its form, quantity, and packaging. It must be a material for which exceptions are provided in the table of 49 CFR 172.101. The DGR lists consumer commodities as a class 9 material.

In most instances, the hazard of a material sampled is unknown because no laboratory testing has been conducted. A determination as to the suspected hazard of the sample must be made using knowledge of the site, field observations, field tests, and other available information.

According to 40 CFR 261.4(d) and (e), samples transported to a laboratory for testing or treatability studies, including samples of hazardous wastes, are **not** hazardous wastes. Air carriers will not accept a shipment of hazardous waste.

2.2 PACKAGING NONHAZARDOUS SAMPLES

Nonhazardous samples, after being appropriately containerized, labeled, and tagged, should be packaged in the following manner.

1. Place the sample in a resealable plastic bag.

2. Place the bagged sample in a cooler and pack it to prevent breakage.

3. Prevent breakage of bottles during shipment by either wrapping the sample container in bubble wrap, or lining the cooler with a noncombustible material such as vermiculite. Vermiculite is especially recommended because it will absorb any free liquids inside the cooler. It is recommended that the cooler be lined with a large plastic garbage bag before samples, ice, and absorbent packing material are placed in the cooler.

4. Add a sufficient quantity of ice to the cooler to cool samples to 4 °C. Ice should be double bagged in resealable plastic bags to prevent the melted ice from leaking out. As an option, a temperature blank (a sample bottle filled with distilled water) can be included with the cooler.

5. Seal the completed chain-of-custody forms in a plastic bag and tape the plastic bag to the inside of the cooler lid.

6. Tape any instructions for returning the cooler to the inside of the lid.

7. Close the lid of the cooler and tape it shut by wrapping strapping tape around both ends and hinges of the cooler at least once. Tape shut any drain plugs on the cooler.

8. Place two signed custody seals on the cooler, ensuring that each one covers the cooler lid and side of the cooler. Place clear plastic tape over the custody seals.

9. Place address labels on the outside of the cooler, if samples are to be shipped by a commercial carrier.

2.2 PACKAGING HAZARDOUS SAMPLES

Packaging of hazardous samples should only be performed by individuals with DOT shipping training. The procedures for packaging hazardous samples are summarized below. Note that according to the DGR, all spellings must be exactly as they appear in the List of Dangerous Goods, and only approved abbreviations are acceptable. The corresponding HMR regulations are provided in parentheses following any DGR references. The HMR must be followed only if shipping hazardous samples by ground transport.

1. Determine the proper shipping name for the material to be shipped. All proper shipping names are listed in column B of the List of Dangerous Goods table in Section 4 of the DGR (or column 2 of the Hazardous Materials Table in 49 CFR 172.101). In most instances, a generic name based on the hazard class of the material is appropriate. For example, a sample of an oily liquid collected from a drum with a high photoionization detector (PID) reading should be packaged as a flammable liquid. The proper shipping name chosen for this sample would be "flammable liquid, n.o.s." The abbreviation "n.o.s." stands for "not otherwise specified" and is used for generic shipping names. Typically, a specific name, such as acetone, should be inserted in parentheses after most n.o.s. descriptions. However, a technical name is not required when shipping a sample for testing purposes and the components are not known. If shipping a hazardous substance (see definition), then the letters "RQ" must appear in front of the proper shipping name.

2. Determine the United Nations (UN) identification number, class or division, subsidiary risk if any, required hazard labels, packing group, and either passenger aircraft or cargo aircraft packing instructions based on the quantity of material being shipped in one package. This information is provided in the List of Dangerous Goods (or Hazardous Materials Table in 49 CFR 172.101) under the appropriate proper shipping name. A "Y" in front of a packing instruction indicates a limited quantity packing instruction. If shipping dry ice or a limited quantity of a material, then UN specification shipping containers do not need to be used.

3. Determine the proper packaging required for shipping the samples. Except for limited quantity shipments and dry ice, these UN specification packages have been tested to meet the packing group of the material being shipped. Specific testing requirements of the packages are listed in Section 6 of the DGR (or 49 CFR 178 of the HMR). All UN packages are stamped with the appropriate UN specification marking. Prior planning is required to have the appropriate packages on hand during a sampling event where hazardous samples are anticipated. Most samples can be shipped in either a 4G fiberboard box, a 1A2 steel drum, or a 1H2 plastic drum. Drums can be purchased in 5- and 20-gallon sizes and are ideal for shipping multiple hazardous samples. When FedEx is used to ship samples containing PCBs, the samples must be shipped in an inner metal packaging (paint can) inside a 1A2 outer steel drum. This method of packaging PCB samples is in accordance with FedEx variation FX-06, listed in Section 2 of the DGR.

4. Place each sample jar in a separate resealable plastic bag. Some UN specification packages contain the sample jar and plastic bag to be used when shipping the sample.

5. Place each sealed bag inside the approved UN specification container (or other appropriate container if a limited quantity or dry ice) and pack with enough noncombustible, absorbent, cushioning material (such as vermiculite) to prevent breakage and to absorp liquid.

6. Place chain-of-custody forms in a resealable plastic bag and either attach it to the inside lid of the container or place it on top inside the container. Place instructions for returning the container to the shipper on the inside lid of the container as appropriate. Close and seal the shipping container in the manner appropriate for the type of container being used.

7. Label and mark each package appropriately. All irrelevant markings and labels need to be removed or obliterated. All outer packaging must be marked with proper shipping name, UN identification number, and name and address of the shipper and the recipient. For carbon dioxide, solid (dry ice), the net weight of the dry ice within the package needs to be marked on the outer package. For limited quantity shipments, the words "limited quantity" or "LTD. QTY." must be marked on the outer package. Affix the appropriate hazard label to the outer package. If the material being shipped contains a subsidiary hazard, then a subsidiary hazard label must also be affixed to the outer package. The subsidiary hazard label is identical to the primary hazard label except that the class or division number is not present. It is acceptable to obliterate the class or division marking on a primary hazard label and use it as the subsidiary hazard label. If using cargo aircraft only packing instructions, then the "Cargo Aircraft Only" label must be used. Package orientation labels (up arrows) must be placed on opposite sides of the outer package. Figure 1 depicts a properly marked and labeled package.

8. If using an overpack (see definition), mark and label the overpack and each outer packaging within the overpack as described in step 7. In addition, the statement "INNER PACKAGES COMPLY WITH PRESCRIBED SPECIFICATIONS" must be marked on the overpack.

9. Attach custody seals, and fill out the appropriate shipping papers as described in Section 2.4.

2.4 SHIPPING PAPERS FOR HAZARDOUS SAMPLES

A "Shippers Declaration for Dangerous Goods" and "Air Waybill" must be completed for each shipment of hazardous samples. Air carriers generally supply a their own Dangerous Goods Airbill to their customers; the airbill typically combines both the declaration and the waybill. An example of a completed Dangerous Goods Airbill is depicted in Figure 2. A shipper's declaration must contain the following:

- Name and address of shipper and recipient
- Air waybill number (not applicable to the HMR)
- Page ___ of ___
- Deletion of either "Passenger and Cargo Aircraft" or "Cargo Aircraft Only," whichever does not apply
- Airport or city of departure
- Airport or city of destination
- Deletion of either "Non-Radioactive" or "Radioactive," which ever does not apply

- The nature and quantity of dangerous goods. This includes the following information in the following order (obtained from the List of Dangerous Goods in the DGR): proper shipping name, class or division number, UN identification number, packing group number, subsidiary risk, quantity in liters or kilograms (kg), type of packaging used, packing instructions, authorizations, and additional handling information. Authorizations include the words "limited quantity" or "LTD. QTY." if shipping a limited quantity, any special provision numbers listed in the List of Dangerous Goods in the DGR, and the variation "USG-14" when a technical name is required after the proper shipping name but not entered because it is unknown.

- Signature for the certification statement

- Name and title of signatory

- Place and date of signing certification

- A 24-hour emergency response telephone number for use in the event of an incident involving the dangerous good

- Emergency response information attached to the shipper's declaration. This information can be in the form of a material safety data sheet or the applicable North American Emergency Response Guidebook (NAERG; DOT 1996) pages. Figure 3 depicts the appropriate NAERG emergency response information for "Flammable liquids, n.o.s." as an example.

Note that dry ice does not require an attached shipper's declaration. However, the air waybill must include the following on it: "Dry ice, 9, UN1845, ____ x ____ kg." The blanks must include the number of packages and the quantity in kg in each package. If using FedEx to ship dry ice, the air waybill includes a box specifically for dry ice. Simply check the appropriate box and enter in the number of packages and quantity in each package.

The HMR requirements for shipping papers are located in 49 CFR 172 Subpart C.

3.0 POTENTIAL PROBLEMS

The following potential problems may occur during sample shipment:

- Leaking package. If a package leaks, the carrier may open the package, return the package, and if a dangerous good, inform the Federal Aviation Administration (FAA), which can result in fines.

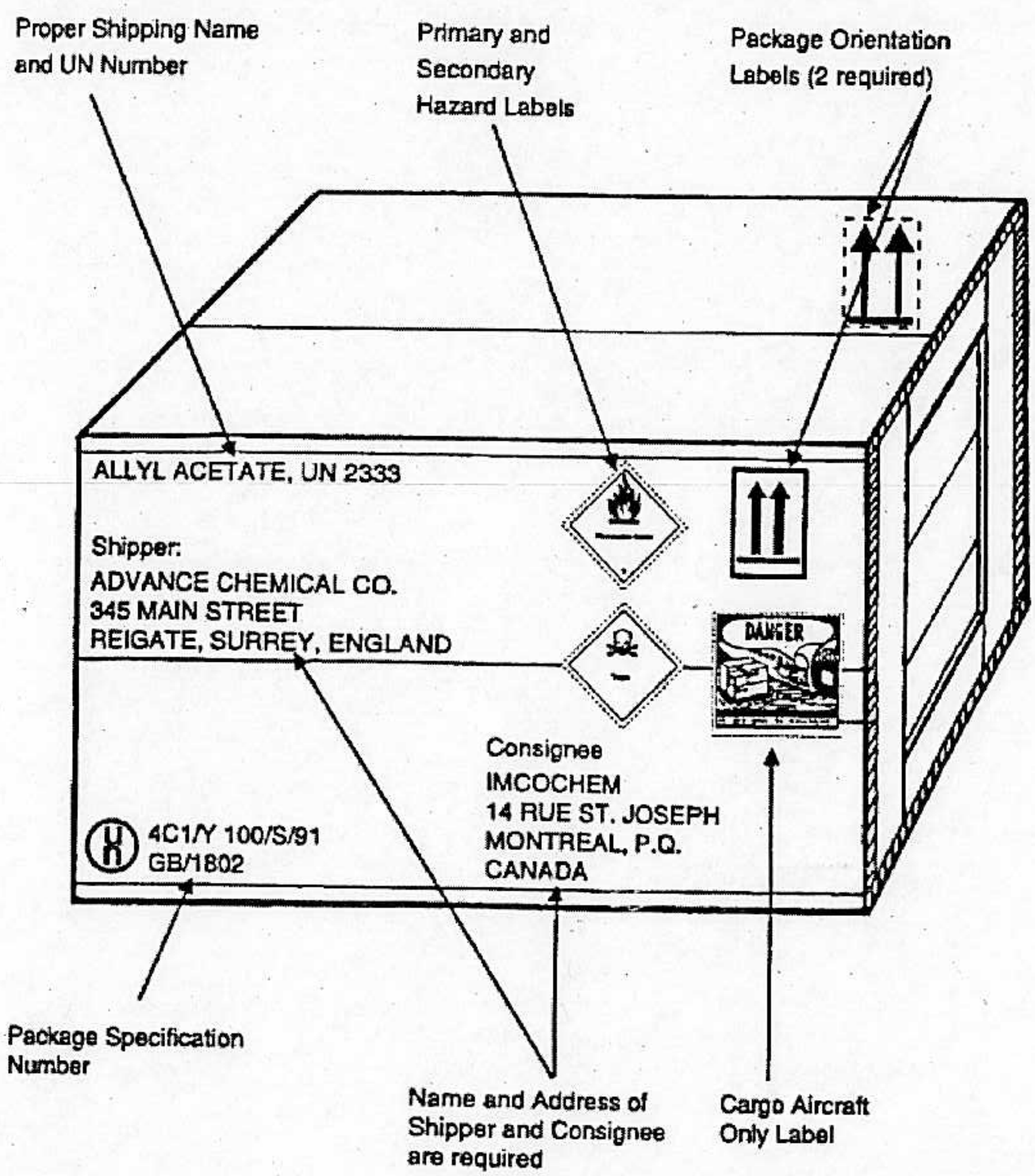
- Improper labeling and marking of package. If mistakes are made in labeling and marking the package, the carrier will most likely notice the mistakes and return the package to the shipper, thus delaying sample shipment.

- Improper, misspelled, or missing information on the shipper's declaration. The carrier will most likely notice this as well and return the package to the shipper.

Contact the air carrier with questions about dangerous goods shipments and ask for a dangerous goods expert.

FIGURE 1

EXAMPLE OF A CORRECTLY MARKED AND LABELED DANGEROUS GOODS PACKAGE



Source: International Air Transport Association (IATA). 1997.

FIGURE 2

EXAMPLE OF A DANGEROUS GOODS AIRBILL

FedEx *Dangerous Goods Airbill*

Senders Copy

RETAIN THIS COPY FOR YOUR RECORDS

The World On Time.

1 From

Date FILL IN

Sender's FedEx Account Number 1788-8C14-4

Sender's Name FILL IN

Phone (312) 856 8700

Company TETRA TECH EM INC

Address 200 E RANDOLPH ST STE 4700

City CHICAGO State IL ZIP 60603

2 Your Internal Billing Reference FILL IN

3 To

Recipient's Name FILL IN

Phone ( )

Company

Address

City State ZIP

For HOLD at FedEx Location check here

For WEEKEND Delivery check here

4a Express Package Service

☒ FedEx Priority Overnight

☐ FedEx Standard Overnight

☐ FedEx 2Day

☐ FedEx Express Saver

4b Express Freight Service

☐ FedEx 1Day Freight

☐ FedEx 2Day Freight

☐ FedEx 3Day Freight

Questions? Call 1-800-Go-FedEx (800-463-3339) or Visit our Web site at www.fedex.com

5 Packaging

☒ Other Packaging

Dangerous Goods cannot be shipped in FedEx packaging.

6 Special Handling

☒ Dangerous Goods as per attached Shipper's Declaration

☐ Cargo Aircraft Only

7 Payment

☒ Sender ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

Total Packages | Total Weight | Total Declared Value $ .00

Signature Release Unavailable

374

FedEx Tracking Number 813350883058 0204

Page 1 of 1 Pages

Two completed and signed copies of this Declaration must be handed to the operator.

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

TRANSPORT DETAILS

Airport of Departure: Chicago

Airport of Destination: "City sending sample to"

Shipment type: NON-RADIOACTIVE ~~RADIOACTIVE~~

NATURE AND QUANTITY OF DANGEROUS GOODS

Proper Shipping Name	Class or Division	UN or I.D. No.	Packing Group	Subsidiary Risk	Quantity and Type of Packaging	Packing Inst.	Authorization
Flammable liquid, n.o.s.	3	UN 1993	III	—	4 glass jars in a 1A2 steel drum Net Quantity = 4L	309	A3 USG-14

Additional Handling Information

NAERG# 128 Attached.

Prepared for AIR TRANSPORT according to: (Customer MUST check one) ☐ 49 CFR ☒ ICAO/IATA

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked, and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Name/Title of Signatory: me, Environmental Scientist

Place and Date: 200 E Randolph, Chicago, IL xx/xx/xx

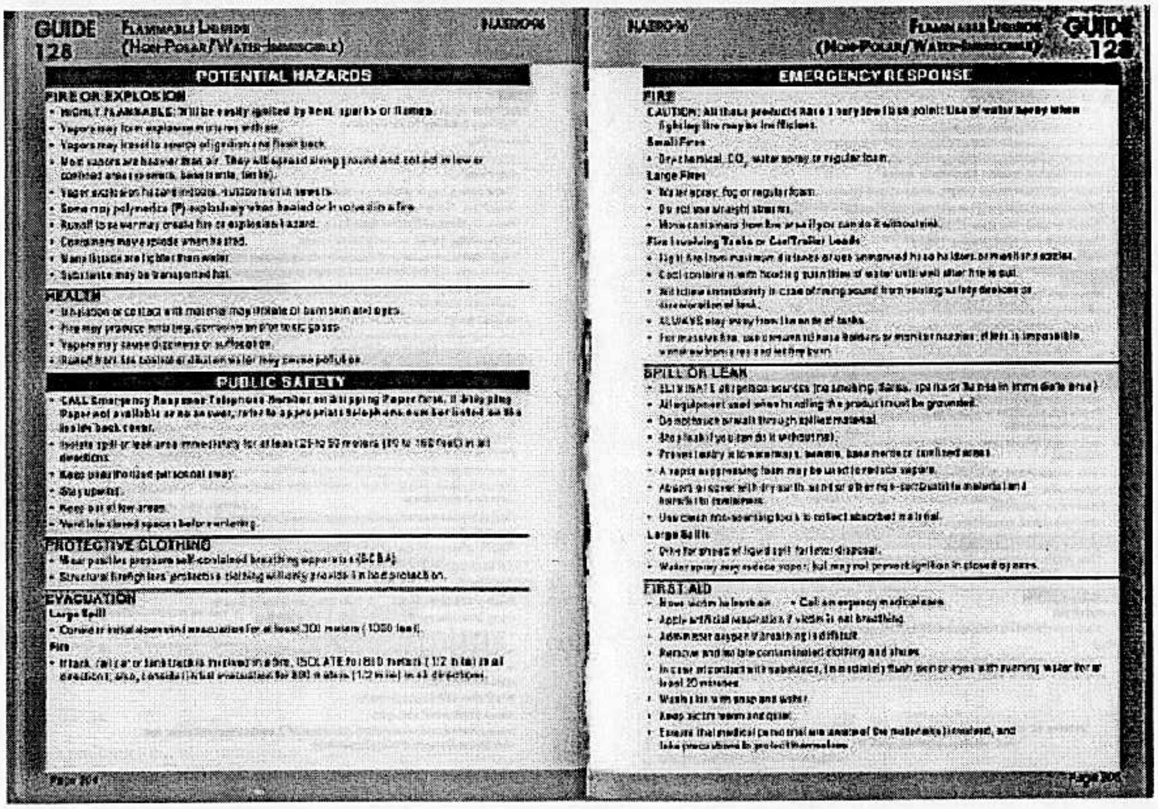
Signature: me

Emergency Telephone Number: FILL IN

IF ACCEPTABLE FOR PASSENGER AIRCRAFT THIS SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN, OR INCIDENT TO, RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT.

FIGURE 3

**NAERG EMERGECY RESPONSE INFORMATION
FOR FLAMMABLE LIQUIDS, N.O.S.**



GUIDE 128 Flammable Liquids (Non-Polar/Water-Immiscible) NAERG96

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Containers may explode when heated.

HEALTH

PUBLIC SAFETY

- Stay upwind.

PROTECTIVE CLOTHING

EVACUATION

Large Spill

Fire

NAERG96 Flammable Liquids (Non-Polar/Water-Immiscible) GUIDE 128

EMERGENCY RESPONSE

FIRE

Small Fires

Large Fires

SPILL OR LEAK

Large Spills

FIRST AID

Source: DOT and others. 1996.

APPENDIX G

EXAMPLE FIELD FORMS

FIELD LOG OF BORING

SHEET ____ OF ____

LOCATION OF BORING:	PROJECT:	BORING NO. / TOTAL DEPTH:
	JOB NO.:	LOGGED BY:
	PROJ. MGR.:	EDITED BY:
	DRILLING CONTRACTOR:	
	DRILL RIG TYPE:	
	DRILLERS NAME:	
	SAMPLING METHODS:	
	HAMMER WT.:	DROP:
	STARTED, TIME:	DATE:
	COMPLETED, TIME:	DATE:

BORING DEPTH (ft.)			
CASING DEPTH (ft.)			
WATER DEPTH (ft.)			
TIME:			
DATE:			

BACKFILLED, TIME: DATE: BY:

SURFACE ELEV.: DATUM:

CONDITIONS:

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										10		

FF7

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FIELD LOG OF BORING (CONTINUED)

SHEET ____ OF ____

PROJECT: | NO. | BORING NO.

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG	
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

MACTEC
5341 Old Redwood Highway
Suite 300
Petaluma, CA 94954
(707) 793-3800

CHAIN OF CUSTODY FORM

Seq. No.: № 1267

Samplers: ______

Lab: ______

Job Number: ______

Name/Location: ______

Project Manager: ______ Recorder: ______
(Signature Required)

MATRIX			# CONTAINERS & PRESERV.					SAMPLE NUMBER		DATE				STATION DESCRIPTION		ANALYSIS REQUESTED
Water	Soil	Air	Unpres.	H2SO4	HNO3	HCL		YR	SEQ	YR	MO	DAY	TIME		DEPTH	

ADDITIONAL INFORMATION

SAMPLE NUMBER		TURNAROUND TIME/ REMARKS
YR	SEQ	

CHAIN OF CUSTODY RECORD

Relinquished By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time
Received By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time
Relinquished By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time
Received By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time
Relinquished By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time
Received By *(Signature)*	*(Print Name)*	*(Company)*	Date/Time

Method of Shipment:

Project: ______________________________ Job No.: ______________
Subject: FIELD INVESTIGATION DAILY REPORT Date: ______________
Equipment Rental: ______________ Company: ______________ To: ______________
Equipment Hours: ______________ F.E. Time from: ________ to: ________ By: ______________

(Outside service and expense record must be attached for any outside costs)

Attachments:

Initial

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GROUNDWATER LEVEL MEASUREMENTS LOG

Circle type of organic vapor meter used: PID FID

Well Number	PID/FID Reading (ppm)	Time	Depth to Groundwater (ft.) (three measurements)			Depth to Bottom (ft.)	Comments
			1st	2nd	3rd		

Date: ____________

Field Staff: ____________ **Field Staff Signature:** ____________

Page No.: ______

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GROUNDWATER SAMPLING FORM

Well Number: ____

Well Type: ☐ Monitor ☐ Extraction ☐ Other ___
☐ PVC ☐ St. Steel ☐ Other ___

Job Name: ____

Job Number: ____

Date: ____

Recorded By: ____ (Signature)

Sampled By: ____ (Initials)

Reviewed by: ____

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): ____
Total Depth of Casing (TD in ft BTOC): ____
Water Level Depth (WL in ft BTOC): ____
No. of Well Volumes to be purged (# V): ____

PURGE METHOD

☐ Bailer - Type: ____
☐ Submersible - Type: ____
☐ Other - Type: ____

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top
☐ Other ____

Depth in feet (BTOC): ____

Screen Interval in feet (BTOC): from ____ to ____

PURGE VOLUME CALCULATION

(____ - ____) X ____ ^{2} X 3 X 0.0408 = ____ gals

TD (feet) WL (Feet) D (inches) # V Calculated Purge Volume

Field Parameter Measurement

Minutes	pH	Conductivity (µS)	Temp. ☑ °C ☐ °F	Turbidity (NTU)
Initial				
Meter S/N				

PURGE TIME

Purge Start: ____

Purge Stop: ____

Elapsed: ____

PURGE RATE

GPM: ____

GPM: ____

PURGE VOLUME

Volume: ____ gallons

Observations During Purging (Well Condition, Color, Odor):

____

Discharge Water Disposal: ☐ Sanitary Sewer
☐ Storm Sewer ☐ Other

WELL SAMPLING

☐ Bailer - Type: ____

Sample Time: ____

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments

QUALITY CONTROL SAMPLES

Duplicate Samples		Blank Samples		Other Samples	
Original Sample No.	Dupl. Sample No.	Type	Sample No.	Type	Sample No.

Photographic Reporting Data Sheets

Job # ______________________________

Photographer Name: ______________________________

Picure ID	Time Taken	Location	Picture Description (including subject, picture orientation [which direction you were facing when taking the picture], distance to subject, and scale of subject)

Field Well Completion Form

Well Name:

Job Name:

Job Number: Date:

Project Manager:

Logged by:

Drilling Company:

Driller:

Equipment:

_________ Inch Hollow Stem Auger

_________ Inch Air Rotary

_________ Inch Mud Rotary

_________ Inch Sonic Drill Rig

_________ Other: ____________

Type of drilling Fluids:

Water: ______

Mud: ______

Polymers: ______

Gallons of water Used During Drilling: ________

Method of Decontamination

Prior to Drilling

Water discharged to:

_____ Ground Surface _____ Tank Truck

_____ Storm Sewers _____ Storage Tank

_____ Drums _____ Other: ________

Materials Used

_______ Sacks of ____________________ Sand

_______ Sacks of ____________________ Cement

_______ Gallons of Bentonite Cement Grout Used

_______ % Powdered Bentonite

_______ Gallons of Bentonite Slurry Used

_______ Sacks of Bentonite Gel

_______ Pounds of Bentonite Chips/Pellets*

_______ Feet of _____ Inch PVC/S.S.* Blank Casing

_______ Feet of _____ Inch PVC/S.S.* Slotted Casing

Slot Size _____

_______ Feet of _____ Inch Steel Conductor Casing

_______ Cu. Yd. Cement-Sand Backfill

Backfill Material

_______ Sacks of ____________________ Sand

_______ Pounds of Bentonite Chips/Pellets*

_______ Other ____________

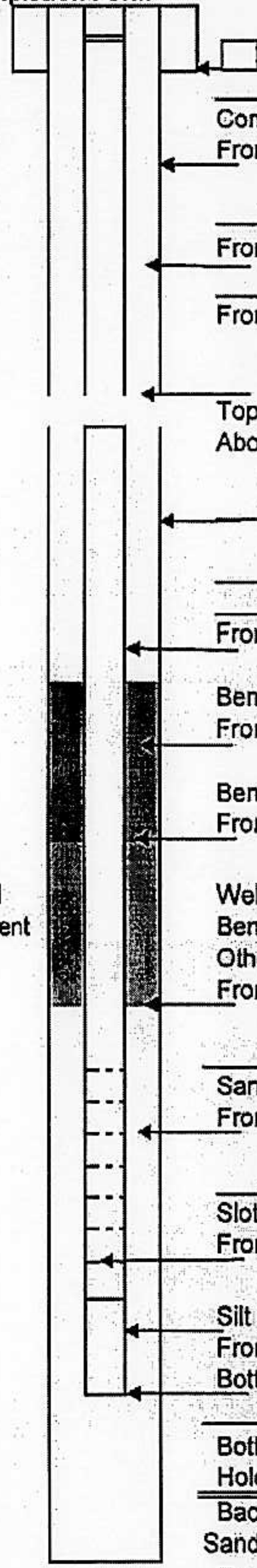
Concrete Pumper Used _____ Yes _____ No

Well Cover Used: _____ Locking Steel Cover

_____ Christy Box

_____ other ____________

Silt Trap Used _____ Yes _____ No



Locking Steel Cover:

____ Inch Diameter Steel Conductor Casing

From______ To________

____ Bentonite- Cement Seal

From______ To________

____ Bentonite Slurry Seal

From______ To______ Feet

Top of Casing at _____ Feet Above/Below Ground Surface

_____ Inch Diameter Borehole

_____ Inch Diameter Schedule

_____ PVC Blank Casing

From______ To______ Feet

Bentonite Cement Seal

From______ To______ Feet

Bentonite Slurry Seal

From______ To______ Feet

Well Seal Type:

Bentonite Chips: _____

Other: _____

From______ To______ Feet

____

Sand Pack

From______ To______ Feet

_____ Inch Diameter

Slotted (______ Inch) Screen

From______ To______ Feet

Silt trap _____ Yes _____ No

From______ To______ Feet

Bottom of Well Cap

_____ Feet

Bottom of Borehole: _____

Hole Cleaned Out To: _____ Feet

Backfilled with Bentonite Chips/ Sand/Slurry/Other*: ________

From______ To______ Feet

Not To Scale

Additional Information: Video logged /E-Logged* _____ Yes _____ No

* Circle applicable

Reviewed by: ____________

MACTEC Engineering and Consulting Inc.

Well Development Form

Project: ____________________ Development Method ____________________ Well No. ____________________

Personel: ____________________ ____________________ Date: ____________________

Time	Depth to water ft.	Gallons Removed	Turbidity (Ntu)	ph	Electrical Conductivity	D.O. mg/liter	Redox Mv	Recovery Rate Inches/min.	Recovery Rate gpm	

Total Gallons Removed: ____________

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Water Level Measurement Log

Job Number:____________
Date:____________
To:____________
Initials:____________
Reviewed by:____________

Well Name	Date	Time	First Reading	Second Reading	Initials	Comments

MACTEC

APPENDIX H

INDOOR CAP INSPECTION AND AIR/SOIL VAPOR SAMPLING, BUILDING 228 REMEDIAL UNIT

REVIEWED BY: RR

DRAFT

22 August 2007

Mr. Ryan Seelbach
Presidio Trust
34 Graham Street
Post Office Box 29052
San Francisco, California 94129-0052

Subject: Building 228 Indoor Air and Cap Assessment Work Plan for the Building 207/231 Area Corrective Action Implementation Work Plan
Presidio Trust, San Francisco, California
(EKI A70004.20)

Dear Mr. Seelbach:

Erler & Kalinowski, Inc. ("EKI") is pleased to present this Building 228 Indoor Air and Cap Assessment Work Plan as an appendix to the Draft *Corrective Action Implementation Work Plan, Building 207/231 Area, Presidio of San Francisco, California*, dated 15 February 2007, prepared by MACTEC. This Work Plan addresses the assessment of potential vapor intrusion to indoor air, indoor air sampling, inspection of the building slab which is serving as a cap to limit potential exposure to residual petroleum hydrocarbons and volatile organic compounds near the building, and review of needs for potential improvements to the cap. This work plan will be implemented as part of the overall Building 207/231 Area Corrective Action Plan.

Please call if you have questions.

Very truly yours,

ERLER & KALINOWSKI, INC.

Michelle King, Ph.D.
Vice President

John DeWitt, P.E.
Project Manager

DRAFT BUILDING 228 INDOOR AIR AND CAP ASSESSMENT WORK PLAN

An Appendix to the
Corrective Action Implementation Work Plan, Building 207-231 Area
Presidio of San Francisco, California

Prepared for:

Presidio Trust
San Francisco, California
(EKI A70004.20)

22 August 2007

DRAFT BUILDING 228 INDOOR AIR AND CAP ASSESSMENT WORK PLAN

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DRAFT BUILDING 228 INDOOR AIR AND CAP ASSESSMENT WORK PLAN

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1.0 INTRODUCTION

On behalf of the Presidio Trust ("Trust"), Erler & Kalinowski, Inc. ("EKI") has prepared this Building 228 Indoor Air and Cap Assessment Work Plan as an appendix to the *Draft Corrective Action Implementation Work Plan, Building 207/231 Area, Presidio of California*, ("Implementation Work Plan") dated 15 February 2007 prepared by MACTEC (MACTEC, 2007). Building 228 ("Site") is located in the northeastern corner of the Presidio, in the Letterman Complex Planning District within Area B of the Presidio, between Halleck Street and Building 229 (see Figure 1). Building 228 is within an area being addressed by the Trust in the Building 207/231 Corrective Action Plan ("CAP") (MACTEC, 2006). The approved corrective action in the CAP for the petroleum-hydrocarbon impacted soil near Building 228 (Existing Building 228 Area co-located Soil and Groundwater Remedial Units) is capping and adoption of a land use control. As described in the CAP, the building foundation of Building 228 and the paved area outside of Building 228 will serve as a cap to limit potential exposure to petroleum hydrocarbons and volatile organic compounds near and potentially under Building 228.

This Work Plan includes an assessment of the potential for vapor intrusion into indoor air within Building 228, indoor air sampling, assessment of the indoor portion of the cap, and review of needs for potential improvements to the indoor portion of the cap. The cap inspection activities for the area outside Building 228 are identified in the Implementation Work Plan, and thus are not included in this appendix to the Work Plan. To assess potential chemicals which may be present in indoor air due to vapor intrusion from the subsurface, soil gas samples are proposed to be collected and analyzed from five locations outside the building perimeter. Soil gas samples from outside the perimeter are proposed because access to the subslab vapor is restricted by the concrete thickness and equipment within the building. Additionally, Building 228 is located on a slope, leaving a wedge between the original grade and the building slab as the grade falls. The composition (and potential presence of) the fill is not certain and an opening to the wedge (potentially a former pipe chase) was noted on the northern side of the building. Samples collected from beneath the slab of Building 228 would not be representative of compounds potentially present below the building due to the presence of ambient air in the wedge. Therefore, data gathered from subslab sample collection would be questionable. The results of soil gas sampling will be used to identify constituents for analysis in the indoor air samples. Once the chemicals that could potentially be vapor intrusion candidates for the building are identified, five indoor air and two ambient air samples will be collected from within and adjacent to Building 228 and analyzed for the potential chemicals of concern ("COCs") identified from the soil gas sampling. The results of the indoor air sampling will be used to determine if mitigation measures are necessary to reduce potential risks to future building occupants due to the potential for vapor intrusion from the subsurface. The indoor air monitoring may not identify all compounds that could be found within the indoor air due to the former activities within Building 228; the scope of this investigation is limited to chemicals that may be present due to subsurface impacts.

EKI has prepared this Work Plan to implement the indoor air and cap assessment at Building 228 in accordance with the Building 207/231 CAP and CAP Implementation Work Plan. The approach of this Building 228 Work Plan was developed taking into account the California Environmental Protection Agency, Department of Toxic Substances Control ("DTSC") guidance entitled *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air,* (DTSC, 2004), U.S. Environmental Protection Agency ("U.S. EPA") guidance entitled *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (US EPA, 2002), and consultation with the Trust, the National Park Service ("NPS"), Regional Water Quality Control Board, San Francisco Bay Region ("Water Board"), and DTSC. The Work Plan incorporates site visits to Building 228 with Trust representatives where potential sample locations were selected and marked. This Work Plan will be provided to the NPS, Water Board, DTSC, and members of the Restoration Advisory Board ("RAB"). Collectively, these parties are referred to as the "stakeholders." The scope of work will be conducted in accordance with the Presidio-wide Quality Assurance Project Plan ("QAPP") (Tetra Tech, 2001).

2.0 BACKGROUND

Detailed site background and remedial approach for the Building 207/231 Area is provided in the Building 207/231 CAP (MACTEC, 2006) and the Implementation Work Plan (MACTEC, 2007). According to the Building 207/231 CAP, Building 228 was constructed in 1909 and formerly operated as a bakery, a warehouse, and later as a laundry facility. Records show that wastewater presumably associated with dry cleaning operations was treated in the building. Three former 750-gallon underground storage tanks ("USTs") (Tanks 228.1, 228.2, and 228.3) were located to the north of Building 228 and were used to store Stoddard solvent used for dry cleaning. A fuel distribution system ("FDS") pipeline ran along the southern side of the building and connected to the building on the southeast side. The Army removed the tanks and pipeline in 1993. The building itself is considered a historic structure with contributive value to the National Historic Landmark and is therefore planned to be preserved. Building 228 is currently utilized as a carpentry shop.

The Building 207/231 CAP identifies two limited areas of residual impact: (1) petroleum hydrocarbon and VOC impacted soil and groundwater between the Site and the historic wall to the north of the building and around the former USTs occupying approximately 330 square feet, identified as the Northern Soil RU, and (2) petroleum hydrocarbon impacted soil around the former fuel distribution pipeline on the south side of the building occupying approximately 80 square feet, identified as the Southern Soil RU. Maximum concentrations of contaminants are identified in Tables 1 through 5 in MACTEC's *Data Gaps Investigation Report, Building 207/231 Area, Presidio of San Francisco, California*, dated 16 December 2004 (MACTEC, 2004). The maximum detected concentrations of total petroleum hydrocarbons ("TPH") as an unknown diesel hydrocarbon and as an unknown gasoline hydrocarbon in soil samples at the Building 228 Area co-located Soil and Groundwater Remedial Units were 150 mg/kg and 4,100 mg/kg, respectively. Ethylbenzene and xylenes were detected in soil samples at maximum concentrations of 49 and 90 mg/kg, respectively. TPH as fuel oil was detected in groundwater at a maximum concentration of 2.4 mg/L, TPH as gasoline was detected in groundwater at a maximum concentration of 0.97 mg/L, TPH as an unknown diesel hydrocarbon was detected in groundwater at a maximum concentration of 5.9 mg/L, and TPH as an unknown gasoline hydrocarbon was detected in groundwater at a maximum concentration of 8.7 mg/L. 1,2-dichlorobenzene ("1,2-DCB") was detected in groundwater at a maximum estimated concentration of 17 µg/L. Additional contamination data found in the Building 207/231 CAP (MACTEC, 2006) is summarized as follows: residual concentrations of TPH as gasoline, fuel oil, and diesel hydrocarbons, ethylbenzene, and xylenes exceed applicable cleanup levels in soil in the Northern Soil RU, and TPH gasoline, fuel oil, and diesel hydrocarbons, and 1,2-DCB were detected in groundwater in this northern RU above cleanup levels. TPH as diesel and fuel oil were detected above cleanup levels in the soil in the Southern Soil RU. Limited access and the planned land use make capping an appropriate remedial alternative. The approved remedial action for the Building 228 area is to maintain and monitor the existing cap, impose a land use control, and implement groundwater monitoring.

The dry cleaning equipment within Building 228 remains in place, though dry cleaning operations ceased in the building in 1984 or 1985. The location of the building on a slope and gaps between the ground and building foundation limit the ability to collect reliable subslab vapor samples from within the building footprint. EKI's review of available building drawings and site walk through confirms the difficulty in collecting representative subslab samples. Therefore, EKI proposes perimeter soil gas sampling to identify potential chemicals in the subsurface at Building 228 that could volatize into indoor air. The scope of this investigation also includes collecting ambient and indoor air samples, as well as inspecting the building slab for functionality as a cap and identifying potential improvements for cap integrity.

The objectives and rationale of the soil gas and indoor air sampling and testing program are described in the Data Quality Objectives section, below.

3.0 DATA QUALITY OBJECTIVES

The data quality objectives ("DQOs") are designed to guide the collection of additional data needed to evaluate the potential for human health risks in indoor air from residual COCs in soil under Building 228. Although DQOs are not generally prepared for Water Board-lead investigations, DQOs have been prepared for this project to illustrate the decision making process. The DQOs are presented in Table 1. Though the Trust's future plans for Building 228 are uncertain, the risk to future recreational or commercial building occupants from exposure to residual subsurface chemicals through the vapor intrusion exposure pathway should be evaluated to provide criteria for likely utilization of the facility.

The DQOs follow the decisions that will be made based on the DTSC and EPA guidances. Only the chemicals detected in soil gas will be analyzed for in the indoor and ambient air samples. However, if no chemicals are identified in the soil gas samples, then the indoor air samples will be analyzed for benzene, toluene, ethylbenzene, xylenes (collectively referred to as "BTEX"), and naphthalene, the primary toxic volatile compounds of TPH, in addition to 1,2-DCB, which was detected in groundwater samples from the Northern Soil RU. TPH as fuel oil and TPH as diesel, which were among the TPH compounds detected at concentrations exceeding cleanup levels, are considered heavier end hydrocarbons and are not generally volatile at normal room temperatures; therefore, these compounds would not be detected in the air samples and are not on the EPA TO-15 analyte list. Additionally, if these fuels were used within the building, results may not indicate if the presence of these compounds is due to vapor intrusion or former use within the building itself.

As described in Table 1 and shown on Figure 1, a total of five soil gas vapor sample locations are proposed at Building 228, in locations on the accessible sides of the building. The results of the soil gas sampling event will be used to identify chemicals that will be analyzed for in the indoor air samples. The DTSC guidance states that if calculated hypothetical health risks for potential future populations at a given sampling location are equal to or less than a cumulative lifetime incremental cancer risk of one-in-one million (10^{-6}) or a total non-carcinogenic hazard index ("HI") is equal to or less than one, indoor air sampling should not be performed. However, in this case, indoor air sampling will still be performed as required in the Building 207/231 CAP. The proposed indoor air sample locations are shown on Figure 2, and may be modified based on the results of the soil gas sampling, i.e., if an area with elevated volatile chemicals in soil gas is identified, indoor air sample locations may be rearranged to determine if vapor intrusion is occurring in the area of the detected chemicals in soil gas. After completion of the soil gas sampling, the air sampling locations will be presented to stakeholders for review and concurrence.

Two key caveats must be noted with the proposed indoor air sampling approach:

- The planned indoor air sampling focuses on the potential for vapor intrusion through the cap into the building. Chemicals that may be present within the building that are not detected in the subsurface will not be analyzed for in the indoor air samples. Therefore, the indoor air sampling results will not provide information about potential human health risks from the indoor air within Building 228 due to chemicals other than those that are present in the subsurface.

- The indoor air sampling will be conducted with the existing mechanical equipment in place. However, removing equipment from the building, cleaning the building interior, modifications to the building slabs, changes to the building ventilation, or other changes could affect the indoor air quality within Building 228.

4.0 FIELD ACTIVITIES

4.1 Pre-Field Activities

To prepare Building 228 for the soil gas vapor and indoor/ambient air sampling described in this Work Plan, the Trust will ideally remove all equipment that is currently stored inside Building 228, pressure-wash the floors within the building, and flush the floor drains prior to field activities. These steps would be conducted to reduce any potential sources of contaminants currently existing in the building. However, EKI understands these steps are not likely feasible, as the Trust's developer will be responsible for removing mechanical equipment after sampling is complete. Therefore, the Trust's preparation activities will consist solely of providing access to sampling locations.[1]

The Trust, NPS, and EKI will select sampling locations in the field; the Water Board, DTSC, and RAB will be invited to the field meeting to provide field input if they choose. EKI will contact Underground Service Alert prior to the initiation of subsurface work, and the utility owners and Trust Utility Department will provide utility clearance prior to drilling. EKI will prepare a site-specific health and safety plan for its workers, and prepare subcontracts with the California-licensed drilling contractor.

4.2 General Field Procedures

4.2.1 General Field Procedures for Collection of Soil Gas Samples

As described in the DQO table (Table 1), EKI will collect soil gas samples from up to 6 locations outside Building 228, as indicated on Figure 2. Using direct push technology, EKI's soil gas sampling contractor (currently planned to be TEG Environmental of Sacramento, California) will install temporary soil gas implants in accordance with the joint DTSC and the California Regional Water Quality Control Board – Los Angeles Region ("LARWQCB") *Advisory – Active Soil Gas Investigations*, dated 28 January 2003 (DTSC and LARWQCB, 2003) ("State Advisory"), the procedures outlined in Appendix A, and Standard Operating Procedures ("SOP") SOP 011, SOP 014, and SOP 015 of the Trust QAPP (included as part of Appendix A). Soil gas samples will be collected from as close as reasonably practical to the buildings (approximately 2-4 feet from the walls) and approximately 5 feet below ground surface ("bgs"), at least 1 foot above local groundwater elevation measured in the nearby groundwater monitoring wells. The soil gas samples will be collected with gas-tight syringes and analyzed by TEG in its onsite mobile laboratory. Temporary tubing to the implants will be removed after gas sample results have been analyzed and EKI determines that no additional sample is needed to obtain analytical results that meet the project reporting limits. The soil gas investigation is anticipated to be completed in one day.

[1] If chemicals of concern that may be from indoor chemical uses are detected in the first round of indoor air sampling above goals discussed in Section 6, the Trust and the Trust's developer may choose to clean the building prior to the second round of indoor air sampling.

In accordance with the QAPP, sample location identification codes are based on "228" for Building 228; "SG" for soil gas; and sequential numbering starting at 101. The media sampled will be marked on the chain of custody form and input into the media field in the Trust database when the data are uploaded. In keeping with the QAPP, a soil gas sample from 5 feet below ground surface will be designated as 228SG101[5].

The proposed sample identification numbers, depths, and corresponding laboratory analyses are summarized in Table 2. As noted in Table 2, the actual sample number and depth may change based on field conditions encountered.

4.2.2 General Field Procedures for Collection of Indoor and Ambient Air Samples

As described above, indoor air sampling will be conducted regardless of whether the soil gas samples indicate a potential human health risk. The indoor air sample locations are proposed in this Work Plan, but could be modified by the Trust based on the soil gas sampling data and presented to stakeholders for review and concurrence. As part of the indoor air sampling program, ambient air samples will also be collected to assess background concentrations of the COCs in ambient air.

Indoor and ambient air samples will be collected as soon as reasonably possible after review of the soil gas sample results. A second round of indoor air sampling is anticipated 3 to 6 months after the first sample, to account for seasonal variations. Indoor air sample collection procedures are described in Appendix A. In accordance with DTSC guidance, indoor air and ambient air samples will be collected in SUMMA canisters and will be analyzed by US EPA Method TO-15 only for chemicals detected in the soil gas samples. If no compounds are detected in soil gas, the air samples will be analyzed for BTEX, naphthalene, and 1,2-DCB. If necessary for the particular chemicals detected in soil gas, analysis may include selective ion monitoring ("SIM") so detection limits will be lower than the risk-based target concentrations for indoor air. Indoor air samples will be collected over an 8-hour period to reflect the commercial exposure scenario. The chemical concentrations measured over the 8-hour period would also be representative of the concentrations that would be present during a hypothetical 3-hour recreational exposure time. Ambient air samples will also be collected over an 8-hour period, but they will be staggered to initiate collection one to two hours before indoor air samples and terminated before the indoor air samples.

Indoor air samples will likely be collected at five locations within Building 228 and two locations outside the building. Potential indoor air samples are shown on Figure 2. However, these locations will be reevaluated based on the soil gas data, and will be discussed with stakeholders prior to implementing the indoor air sampling event. Indoor air samples will likely be collected from the following locations:

- near the dry cleaning equipment on the north side of the building,
- near floor drain near the containment berm on the east side of the building,
- near the boiler in the southeast corner of the building,

- at a central location in the wood shop area, and
- on the northwestern side of the building near a floor drain.

Sample inlets will be approximately three to five feet above the floor. Ambient air samples will be collected outside the building on the northwestern and southwestern sides of the building. The ambient air sampling locations were selected to be in the general upwind direction of the building and to avoid (to the extent possible) physical features such as other buildings that could block wind on the sides of the building, as recommended in the DTSC guidance. Wind direction will be assessed on the day of sampling and ambient air locations may be adjusted, if necessary, so that the sample locations are generally upwind of the building throughout the sample collection period. Locations were also selected to avoid influence of vehicle exhaust traffic on Halleck Street.

4.2.3 General Field Procedures for Indoor Cap Assessment

The indoor cap (floor of Building 228) will be inspected for visible cracks, penetrations, and gaps that could allow COCs to enter the building. Ideally the floor would be cleared and cleaned to facilitate the cap assessment. However, such clearing and cleaning may not be possible. While assessment of the indoor cap can be performed, the assessment is anticipated to be limited in scope to what can visually be seen. Therefore, EKI will visually inspect and photograph the floor, and will prepare a written description of the visible portions of the floor. Areas that cannot be seen will be noted. If penetrations, cracks, or other potential pathways that may allow the migration of COCs into the building are observed, physical improvements will be recommended to address the identified issues. However, depending on the data collected, there may be no indication of vapor intrusion. If large or blatant cracks or penetrations are observed, some options for sealing these penetrations could include concrete patches, epoxy sealants, or other means, depending on the conditions encountered. The suggested repairs, if any, may be performed by the Trust’s Remediation Contractor, a separate contractor, or Trust maintenance personnel, depending on the tasks required, skill sets of the contractors, and purchasing process of the Trust. Modifications to the indoor cap, if any, will be documented in the Construction Completion Report.

4.3 Field Quality Control Samples

One of the advantages of soil gas sampling and analysis with a mobile laboratory is the opportunity to perform the purge volume test, a field quality control test identified in the State Advisory (DTSC and LARWQCB, 2003). In addition, as the data are reported while the field team is still on site, questionable data can be re-sampled and analyzed prior to demobilization, thus reducing the chances of poor data quality due to field collection complications.

Field duplicates for soil gas will be collected as part of this investigation. A field duplicate is a sample collected at the same time, and from the same source and depth as the associated primary sample. Field duplicate pairs are collected to assess the

consistency or precision of the laboratory's analytical system. The QAPP specifies a frequency of ten percent for field duplicates; therefore, one field duplicate sample will be collected and submitted to the laboratory for analysis for both soil gas sampling as well as indoor air sampling.

As described in Appendix A, a trip blank will be submitted for indoor air sampling only.

4.4 Post-Sample Collection Activities

After completion of the soil gas sampling, a State of California-licensed land surveyor will survey the sampling locations. EKI has assumed that PLS Surveys, Inc. of Alameda, California will perform the surveying under the direction of EKI. The surveyor will report the survey coordinates in both NAVD88 and PLLW survey datums, as well as identify the control points used to prepare the survey.

Decontamination rinse water from the investigation, if any, will be drummed and sampled for characterization and appropriate disposal. Other anticipated investigation-derived waste includes containers of plastic bags with used personal protective equipment and non-hazardous trash. The non-hazardous trash will be disposed of with Trust municipal trash. Disposal of all wastes will be the responsibility of the Trust.

5.0 ANALYTICAL METHODS

The soil gas samples will be analyzed by TEG, Inc.'s mobile lab by EPA Method 8260. TEG indicates that the VOC detection limits of the instruments in their mobile laboratory can meet residential California Human Health Screening Levels ("CHHSLs"), with the exception of benzene and vinyl chloride. The detection limits for these two compounds are slightly higher than the residential CHHSLs, but below the commercial/industrial CHHSLs.[2] TEG's mobile laboratory does not provide data in Level III or Level IV data packages. Therefore, the data provided by TEG cannot be validated. The use of a mobile laboratory is not included in the Presidio QAPP, but it allows real-time field measurements and is consistent with the DTSC Guidance (2004). Appendix A to this work plan describes methods for soil gas sampling. The duplicate soil gas sample will be analyzed by Calscience Laboratories of Garden Grove, California, a State-certified analytical laboratory, on a standard two-week turnaround time. The duplicate soil gas sample will be analyzed by EPA Method TO-15, with SIM (if necessary to achieve detection limits to compare to CHHSLs or ESLs).

The indoor and ambient air samples will also be analyzed by Calscience on a standard turnaround time basis. For each round of indoor air sampling, Calscience will analyze an anticipated 7 indoor and ambient air samples, and a quality assurance/quality control ("QA/QC") duplicate sample and a trip blank to be collected in accordance with the Presidio QAPP, as described above.

The soil gas sample duplicates and indoor/ambient air samples will be analyzed by EPA Method TO-15, with SIM (if necessary to achieve detection limits to perform the risk calculations). The indoor and ambient air samples will only be analyzed for constituents detected in the soil gas samples, with the exception previously described if no chemicals are detected in the soil gas samples.

The analytical quality control criteria are provided in the QAPP. Analytical data for samples analyzed by EPA Method TO-15 will be validated by DataVal, Inc. of Novato, California.

[2] The CHHSLs are generally more stringent than the Water Board's Environmental Screening Levels ("ESLs") for VOCs, although some ESLs (such as for toluene and xylenes) have similar values.

6.0 CALCULATION OF POTENTIAL HUMAN HEALTH RISKS

The results of the indoor air sampling events will be used to calculate potential risks to future commercial/industrial workers using the pathways and assumptions presented in Tables 3 and 4.[3] Table 3 identifies the exposed populations and exposure pathways for the vapor intrusion evaluation, and Table 4 identifies the exposure assumptions that will be used to calculate the hypothetical human health risk-based target concentrations for indoor air at Building 228. Many of the exposure assumptions presented in Tables 3 and 4 are similar to those used in the Trust's Cleanup Level Document (EKI, 2002).

The general approach to calculate risks will be as follows:

(1) Develop chemical-specific risk-based target concentrations for indoor air ("$RBTC_{IA}$") for each chemical detected in the soil gas samples. The RBTCs will correspond to a target lifetime incremental cancer risk of 10^{-6} and / or a target Hazard Index of one.

(2) Calculate cumulative risks for each population by summing the ratio of the maximum indoor air concentration with its respective RBTC for carcinogenic and non-carcinogenic COCs. For carcinogens, the summed ratio for each population will be multiplied by 10^{-6} to calculate estimated lifetime incremental cancer risks. For non-carcinogens, the summed ratio for each population will equal the total estimated Hazard Indices.

These steps are described in more detail below.

6.1 Development of Risk-Based Target Concentrations for Indoor Air

For each chemical detected in soil gas samples, chemical-specific risk-based target concentrations for indoor air for cancer risks ("$RBTC_{IA-c}$") in units of µg/m^3 will be calculated according to the following equations:

$$RBTC_{IA\text{-}c} = \frac{\text{Target Risk Level of } 10^{-6}}{\text{CSF} \times \text{CF} \times \text{Inhalation}}$$

where "CSF" is a chemical-specific carcinogenic potency factor for exposure through inhalation in units of (mg/kg-d)$^{-1}$, and "CF" is a conversion factor of 10^{-3} mg/µg. The inhalation exposure to COCs for commercial workers at Building 228 is estimated with the following equation:

[3] The future land use for Building 228 is uncertain at this time. Soil gas and indoor air calculations performed previously at the Building 937 Area (EKI, 2006) for recreational and commercial/industrial exposure scenarios resulted in more stringent risk levels for the commercial/industrial exposure scenario. The risk calculations were driven by the commercial/industrial exposure scenario. Therefore, only commercial/industrial exposure calculations are presented in this document.

$$\text{Inhalation} = \frac{\text{IR} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

where "IR" is the applicable Inhalation Rate in units of m^3/d; "EF" is Exposure Frequency in days/year; "ED" is Exposure Duration in years; "BW" is the applicable Body Weight in kg; and "AT" is averaging time in days. Collectively, these parameters are referred to as Exposure Factors and specific values for the scenarios evaluated at Building 228 are presented in Table 4. The appropriate values should be substituted into the equation to calculate $RBTC_{IA\text{-}c}$ value.

For non-carcinogenic COCs, risk-based target concentrations for indoor air ("$RBTC_{IA\text{-}nc}$") will be calculated with the following equation:

$$RBTC_{IA\text{-}nc} = \frac{R\mathit{f}D \times \text{Target HI of 1}}{\text{CF} \times \text{Inhalation}}$$

where "HI" is the Hazard Index, a method of quantifying the degree of chemical exposure below which it is unlikely for even sensitive populations to experience adverse health effects, "RfD" is the chemical-specific inhalation Reference Dose in mg/kg-d, and "CF" is a conversion factor of 10^{-3} mg/µg. As above for carcinogens, the appropriate values should be substituted into the equation to calculate $RBTC_{IA\text{-}nc}$ value.

Carcinogenic slope factors ("CSFs") and non-carcinogenic reference doses ("RfDs") used in the above equations will be obtained from the following hierarchy of regulatory sources as described in the Cleanup Level Document (EKI, 2002), which is generally consistent with ESLs:

- Cal/EPA OEHHA Toxicity Criteria Database.
- U.S. EPA's computerized Integrated Risk Information System ("IRIS").
- U.S. EPA's Health Effects Assessment Summary Tables ("HEAST"), dated July, 1997.
- U.S. EPA's Preliminary Remediation Goals ("PRG") Tables.

6.2 Development of Risk-Based Target Concentrations for Soil Gas

RBTCs for indoor air ("$RBTC_{IA}$" in µg/m^3) can be converted into equivalent RBTCs for soil gas ("$RBTC_{SG}$" in µg/L) using the following equation:

$$RBTC_{SG} = \frac{RBTC_{IA}}{\alpha_{SG}} \times CF$$

where "CF" is a Conversion Factor of 10^{-3} m^3/L and "α_{SG}" is the Soil Gas Attenuation Factor (unitless).

The soil gas attenuation factors for COCs identified in soil gas will be calculated using the Johnson and Ettinger ("J&E") model for soil gas (SG-ADV.xls) as published by U.S. EPA (2004). The J&E model calculates a chemical-specific infinite source soil gas to indoor air attenuation factor in one of the intermediate calculations spreadsheets. This attenuation factor is the one used to calculate RBTCs for soil gas, using the equation shown above. Presidio-specific parameters obtained during the Building 937 investigation (EKI, 2006) will be used to perform the calculations. The concentrations detected in soil gas will be compared to the calculated $RBTC_{SG}$ as well as ESLs to support the overall assessment of the data obtained during implementation of the work plan.

6.3 Calculation of Cumulative Human Health Risks

The chemical-specific risks and HIs due to vapor intrusion measured in indoor air will be calculated for each population by summing the ratio of the maximum indoor air concentration with its respective $RBTC_{IA}$ for carcinogenic and non-carcinogenic COCs. For carcinogens, the summed ratio for each population will be multiplied by 10^{-6} to calculate estimated lifetime incremental cancer risks. For non-carcinogens, the summed ratio for each population will equal the total estimated Hazard Indices.

The equation for calculating the estimated lifetime incremental cancer risk for each population is as follows:

$$Risk_{population} = \sum \frac{C_{IA-i} \times 10^{-6}}{RBTC_{IA-c-i}}$$

where C_{IA-i} is the maximum concentration of carcinogenic chemical "i" in the indoor air samples and $RBTC_{IA-c-i}$ is the risk-based indoor air carcinogenic target concentration for that chemical "i".

Similarly, the total Hazard Index ("HI") for each population is as follows:

$$HI_{population} = \sum \frac{C_{IA-i}}{RBTC_{IA-nc-i}}$$

where C_{IA-i} is the maximum concentration of non-carcinogenic chemical "i" in the indoor air samples and $RBTC_{IA-nc-i}$ is the risk-based soil gas non-cancer target concentration for that chemical "i".

The results of the indoor and ambient air sampling event will be used to calculate potential risks, using the equations and methods described above. No soil vapor to indoor air attenuation factor will be needed for these calculations, as direct indoor air measurements will be used. The indoor air risks will be compared with the risks calculated for ambient air and the ratios of the compounds detected in soil gas and indoor air will be assessed. Together, this information will be used to determine if the

constituents and levels of chemicals detected in indoor air are representative of ambient air or other potential sources and to evaluate the significance of the indoor air risk due to vapor intrusion from the subsurface. This information will be used to determine if mitigation measures, such as cap sealing, are necessary to reduce potential risks to future building occupants.

7.0 SCHEDULE

EKI recognizes that the schedule of this sampling event is important to the Trust for leasing purposes as well as coordination with the Building 207/231 CAP Implementation Work Plan. Field activities will commence upon stakeholder approval of this Work Plan. For planning purposes, EKI anticipates soil gas sampling will be performed in [MONTH] 2007, assuming stakeholder approval is obtained by [DATE] 2007. It is anticipated that the soil gas sampling events can be completed in one day. Upon receipt of the laboratory data, EKI will review the data and calculate potential human health risks. EKI will provide the Trust with a summary of potential health risks within two weeks of the receipt of the laboratory data.

After review of the soil gas data, the Trust will schedule a conference call with the stakeholders to discuss the existing data and agree upon air sampling locations and chemical parameters to be evaluated.

The second indoor air sampling event will be scheduled approximately six months after the first round of indoor air sampling. The Trust will provide advance notice to the stakeholders of the sampling date. The same process of reviewing the results will be conducted as described above for the first sampling event.

A sampling report will be prepared after receipt of the validated analytical data, for inclusion with the Building 207/231 CAP Implementation Construction Completion Report. [CONFIRM REPORT NAME]

8.0 REFERENCES

DTSC, 2004. *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. December. Revised Feb. 7, 2005.

DTSC and LARWQCB, 2003. *Advisory – Active Soil Gas Investigations*. 28 January 2003.

Erler & Kalinowski, Inc. ("EKI"), 2006. *Buildings 933 and 937 Vapor Intrusion Assessment and Field Sampling Report, Presidio of San Francisco, California*. October.

EKI, 2002. *Development of Presidio-Wide Cleanup Levels for Soil, Sediment, Groundwater and Surface Water, Presidio of San Francisco, California*. October, as revised in May 2006.

MACTEC Engineering and Consulting, Inc. ("MACTEC"), 2007. *Draft Corrective Action Implementation Work Plan, Building 207/231 Area, Presidio of San Francisco, California*. 15 February.

MACTEC, 2006. *Final Corrective Action Plan, Building 207/231 Area, Presidio of San Francisco, California*. 24 August.

MACTEC, 2004. *Data Gaps Investigation Report, Building 207/231 Area, Presidio of San Francisco, California.* 16 December.

Regional Water Quality Control Board, San Francisco Bay Region, *Site Cleanup Requirements, Presidio of San Francisco, California*, Order R2-2003-0080.

Tetra Tech, 2001. *Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan, Presidio of San Francisco, California*. April.

US EPA, 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* November.

TABLE 1 - BUILDING 228 DATA QUALITY OBJECTIVES

Presidio of San Francisco, California

State the Problem	Identify the Decisions	Identify Inputs to the Decisions	Define the Study Boundaries	Develop Decision Rules	Specify Limits on Decision Errors	Optimize the Design
Total petroleum hydrocarbons ("TPH") as gasoline, diesel, and fuel oil and volatile organic compounds ("VOCs") have been detected in soil and groundwater above applicable cleanup levels in areas north of Building 228 and TPH as diesel and fuel oil have s been detected in soil above applicable cleanup levels south of Building 228. The Building 207/231 Area Corrective Action Plan ("CAP") states that indoor air monitoring will be conducted to evaluate the potential for vapor intrusion of volatile organic compounds ("VOCs") from the subsurface into indoor air. The CAP also requires inspection of the building slab to assess potential for vapor intrusion. Three former underground storage tanks (228.1, 228.2, and 228.3) are located to the north of the building were used by the Army to store Stoddard solvents for the dry cleaning operations at Building 228. The tanks have been removed; however, contaminated soil in this area cannot be removed without compromising the historical wall's structural integrity. This sampling program is proposed to evaluate whether residual subsurface chemicals pose a significant risk to future recreational or commercial building occupants through the indoor air exposure pathway. Effectiveness of subslab vapor sampling is limited by the position of the building on a slope and subslab access; therefore, perimeter soil gas sampling is proposed. Indoor air sample locations will be based on soil gas sample results.	1. Are residual petroleum hydrocarbons and VOCs from previous Army impacts present in the soil gas at Building 228? 2. If residual petroleum hydrocarbons and VOCs are present in the subslab vapor or soil gas, are they present at concentrations that are potentially a significant risk (i.e., greater than 10^{-6} lifetime incremental cancer risk or a cumulative noncancer hazard index ("HI") >1)? 3. If petroleum hydrocarbons and VOCs are present in soil gas, are these same chemicals also present in indoor air? 4. If petroleum hydrocarbons and VOCs are present in indoor air, is there a geographic distribution of the concentrations within the building? 5. Are the petroleum hydrocarbons and VOCs detected in the soil gas and indoor air samples also present in ambient air samples? 6. Are petroleum hydrocarbons and VOCs present in indoor air at concentrations that pose a significant risk relative to ambient air and background (e.g., non-subsurface contributions), as shown in the table in Contingency Planning section of the DTSC Guidance (Step 8, page 29)? 7. If petroleum hydrocarbons and VOCs are present in soil gas and indoor air, are mitigation measures appropriate to reduce the potential risk for the building occupants? 8. Does the existing slab and foundation of Building 228 provide a sufficient cap for limiting potential exposure to residual petroleum hydrocarbons in the subsurface? Are improvements or modifications necessary to enhance the cap?	1. Results of previous chemical analysis of soil and groundwater samples. 2. Results of chemical analysis from soil gas investigation. 3. Results of chemical analysis of indoor air samples (including ambient samples). 4. DTSC Guidance. 5. Visual assessment of the building slab.	The study boundaries for the soil gas investigation are near the perimeter of Building 228 (south of the historic wall) as internal subslab access is not available. The indoor air samples will be collected within Building 228 and outside of the building at locations representative of ambient conditions, in accordance with the DTSC Guidance. The indoor cap assessment will be conducted within Building 228.	1. If chemical concentrations are detected in soil gas samples, the indoor air samples will be analyzed for those analytes. If no chemicals are detected in the soil gas samples, then the indoor air samples will be analyzed for the primary toxic volatile compounds in petroleum hydrocarbons (BTEX and naphthalene) because petroleum hydrocarbons are driving the land use control, in addition to 1,2-DCB, which was detected above screening levels in groundwater samples. Potentially exposed populations and exposure assumptions to assess vapor intrusion risks are presented in the attached Tables 3 and 4. 2. Per DTSC Guidance, the indoor air samples (and associated ambient samples) will only be analyzed for those chemicals detected in soil gas sample analyses, with the exception of the case in which no chemicals are detected (described above). 3. The indoor air samples will be collected as soon as possible after the soil gas sample results are available and have been evaluated. 4. To achieve the DTSC Guidance recommendation for analyses over seasonal differences, a second round of indoor air samples will be collected within 3 to 6 months after the initial sampling event. 5. The risks of chemicals detected in ambient air samples and indoor air samples due to vapor intrusion will be calculated. The risk associated with chemicals in ambient air will be included in the assessment of the significance of indoor air risk due to vapor intrusion. 6. If the risk associated with chemicals in indoor air due to vapor intrusion is less than or equal to that associated with ambient air, then no indoor cap modifications will be proposed. Similarly, if the risk associated with chemicals in indoor air due to vapor intrusion is less than or equal 10^{-6} for carcinogens or a HI of 1 for non-carcinogens, then no indoor cap modifications will be proposed.	1. Field, analytical, and data validation procedures will follow the QAPP (Tetra Tech, 2001), as modified to follow DTSC Guidance. Duplicate samples (subslab and indoor air) will also be collected per the QAPP. 2. If no chemicals on the analyte list are detected in any of the indoor air samples or ambient air samples from a single round, the Trust will discuss the results with the laboratory and ascertain if other VOCs were detected but not reported by the laboratory. If no VOCs were detected, in keeping with the DTSC Guidance, the data will be rejected and the sampling event repeated.	The portion of Building 228 acting as a cap is approximately 75' x 70'. 1. Five soil gas samples and one duplicate sample will be collected from locations outside Building 228, as shown on Figure 1. Subslab vapor samples cannot be collected due to slab thickness and access restraints. Samples will be collected from the soil gas from areas near the known impacted soil and around the perimeter of the building. Probes will be advanced to collect soil gas samples at approximately five feet below ground surface. Soil gas samples will be collected in a gas-tight syringe and analyzed by a mobile laboratory for VOCs using US EPA Method 8260. Duplicates of 10% of the soil gas samples will be collected in SUMMA canisters and analyzed at a fixed laboratory by US EPA Method TO-15. 2. Indoor air samples will be collected as soon as reasonably possible after review of soil gas sample results. Indoor air samples and ambient samples will be collected in SUMMA canisters and will be analyzed by US EPA Method TO-15 only for chemicals detected in the soil gas, in accordance with the DTSC Guidance. If no chemicals are detected in soil gas, indoor and ambient air samples will be analyzed for BTEX, naphthalene, and 1,2-dichlorobenzene. Indoor air samples will be collected over an 8-hour period to reflect the commercial and recreational (i.e., non-residential) exposure scenarios. Ambient air samples will be staggered to initiate collection 1 to 2 hours before indoor air samples, and terminate collection approximately 30 minutes before the indoor air samples, per the DTSC Guidance. Indoor air sampling will be conducted at 5 locations within Building 228 and 2 locations outside the building (see Figure 1). Sample inlets will be approximately 3 to 5 feet above the floor. Ambient air samples will be collected outside the building near the northeastern and northwestern corners of the building. The ambient air sampling locations were selected to be upwind of the building and to avoid physical features such as other buildings that could block the wind on the sides of the building, as recommended by the DTSC Guidance.

Abbreviations:

1,2-DCB	1,2-dichlorobenzene
BTEX	benzene, toluene, ethylbenzene, and xylenes
DTSC	Department of Toxic Substances Control, California Environmental Protection Agency
DTSC Guidance	*Interim Final, Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, DTSC, dated 7 February 2005.
HI	Hazard Index
QAPP	*Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan*, Tetra Tech EM Inc., dated April 2001.
RWQCB	Regional Water Quality Control Board
TPH	total petroleum hydrocarbons
U.S. EPA Guidance	*Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, U.S. Environmental Protection Agency, dated November 2002.
VOCs	volatile organic compounds

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TABLE 2
SAMPLE LABORATORY ANALYSIS MATRIX

Presidio of San Francisco, California

Sample ID	Sample Depth (ft bgs) (note 1)	Matrix	Laboratory Analyses	
			VOCs (US EPA 8260)	VOCs (US EPA TO-15)
Soil Gas Samples				
228SG101(5)	5	soil gas	*	Duplicate (2)
228SG102(5)	5	soil gas	*	
228SG103(5)	5	soil gas	*	
228SG104(5)	5	soil gas	*	
228SG105(5)	5	soil gas	*	
Indoor and Ambient Air Samples				
228IA101	na	air		*
228IA102	na	air		*
228IA103	na	air		*
228IA104	na	air		*
228IA105	na	air		*
228IA106	na	air		*
228IA107	na	air		*

Abbreviations:

ft bgs – feet below ground surface
ID – identification
na – not applicable
QA/QC – quality assurance/ quality control
US EPA – United States Environmental Protection Agency

Notes:

(1) Proposed soil sample depths may be modified based on field conditions.
(2) Per QAPP guidance, one duplicate will be collected for every ten samples on each day of the field work. Duplicate samples will be noted with "DUP" in the Sample ID. A duplicate soil gas sample will be collected and analyzed in a fixed laboratory by TO-15.

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TABLE 3
EXPOSED POPULATIONS AND EXPOSURE PATHWAYS FOR BUILDING 228 INDOOR AIR EVALUATION

Presidio of San Francisco, California

Potentially Exposed Populations and Significant Exposure Pathways	Rationale
Residential Use (Children & Adults)	
• None	Building 228 is within an area designated for recreational or commercial uses. Thus, no residential exposure scenarios are considered.
Recreational Use (Children and Adults)	
• Inhalation of VOCs in Indoor Air	Children and adults visiting Building 228 may potentially be exposed to volatile organic compounds ("VOCs") that have migrated from the subsurface into indoor air. No future plans have been made apparent for Building 228. At Building 937, recreational populations were assumed to be present indoors 3 hours/day, 3 days/week (150 days/year) for 30 years whereas the commercial/industrial populations were assumed to be at the building 8 hours/day, 250 days/year for 25 years and breathing at a higher inhalation rate (1.75 m^3/hr vs. 1.2 to 1.6 m^3/hr). Therefore, the commercial/industrial population would be the risk driver. Risk-based target concentrations for the commercial/industrial worker should be protective of potential future users (both recreational and commercial/industrial) of Building 228. Therefore, recreational use is not quantitatively calculated herein.
Commercial/Industrial Use (Adults)	
• Inhalation of VOCs in Indoor Air	Inhalation of VOCs from vapor intrusion to indoor is considered a complete pathway. Commercial/industrial exposure assumes 5 days per week for 25 years.

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TABLE 4
EXPOSURE FACTORS USED TO CALCULATE HYPOTHETICAL COMMERCIAL/INDUSTRIAL HUMAN HEALTH RISK FOR INDOOR AIR AT BUILDING 228

Presidio of San Francisco, California

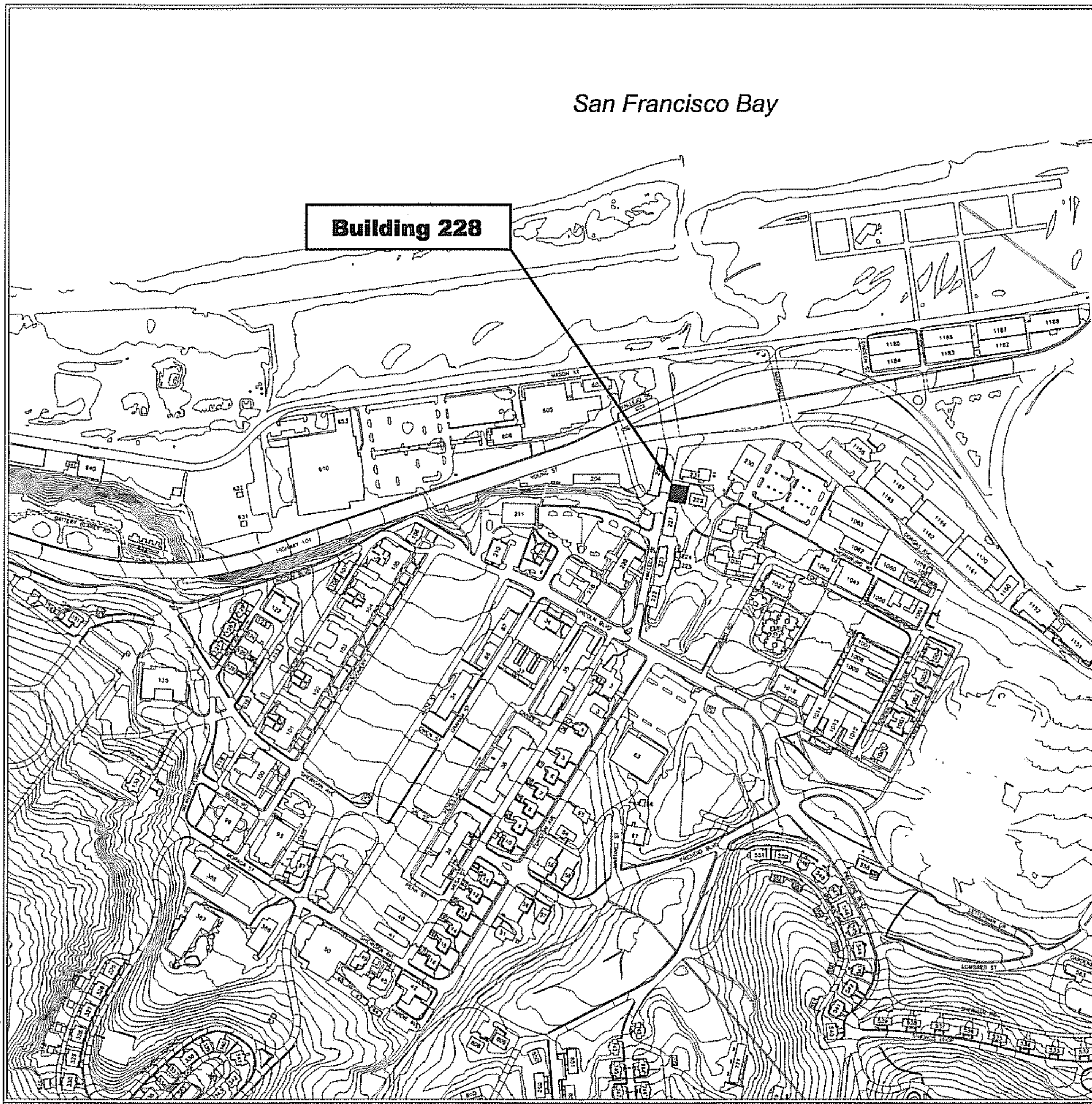
Exposure Parameter	Units	Default or Assumed Value	Reference (a)
Averaging Time (AT)			
Carcinogenic	days	27,375	U.S. EPA, 1997
Non-carcinogenic	days	9,125	U.S. EPA, 1991; DTSC, 1996
Exposure Frequency (EF)	days/year	250	U.S. EPA, 1991; DTSC, 1996
Exposure Duration (ED)			
Carcinogenic and Non-carcinogenic	years	25	U.S. EPA, 1991; DTSC, 1996
Body Weight (BW)	kg	70	U.S. EPA, 1991; DTSC, 1996
Air Inhalation Rate (IR)	m^3/d	14 (equivalent to 1.75 m^3/hr)	U.S. EPA, 1997 (b)

Notes:

(a) References for exposure parameter values are as follows:

- U.S. EPA. 25 March 1991. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors.* Interim Final. OSWER Directive 9285.6-03.
- U.S. EPA. August 1997. *Exposure Factors Handbook Volume I General Factors: Principles and Applications.* Office of Research and Development. EPA 600/P-95/002F.
- DTSC. August 1996. *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities* .

(b) Commercial inhalation rate assumes a "moderate industrial job" with a daily work inhalation rate calculated based on approximately 2 hours of light activity, 4 hours of moderate activity, and 2 hours of heavy activity. References: U.S. EPA 1997 and personal communication with Dr. Kimiko Klein, DTSC.



Reference: Basemap source: Presidio Trust, 2006.

Note:

1. All locations are approximate.

N

0 600 1200

(Approximate Scale in Feet)

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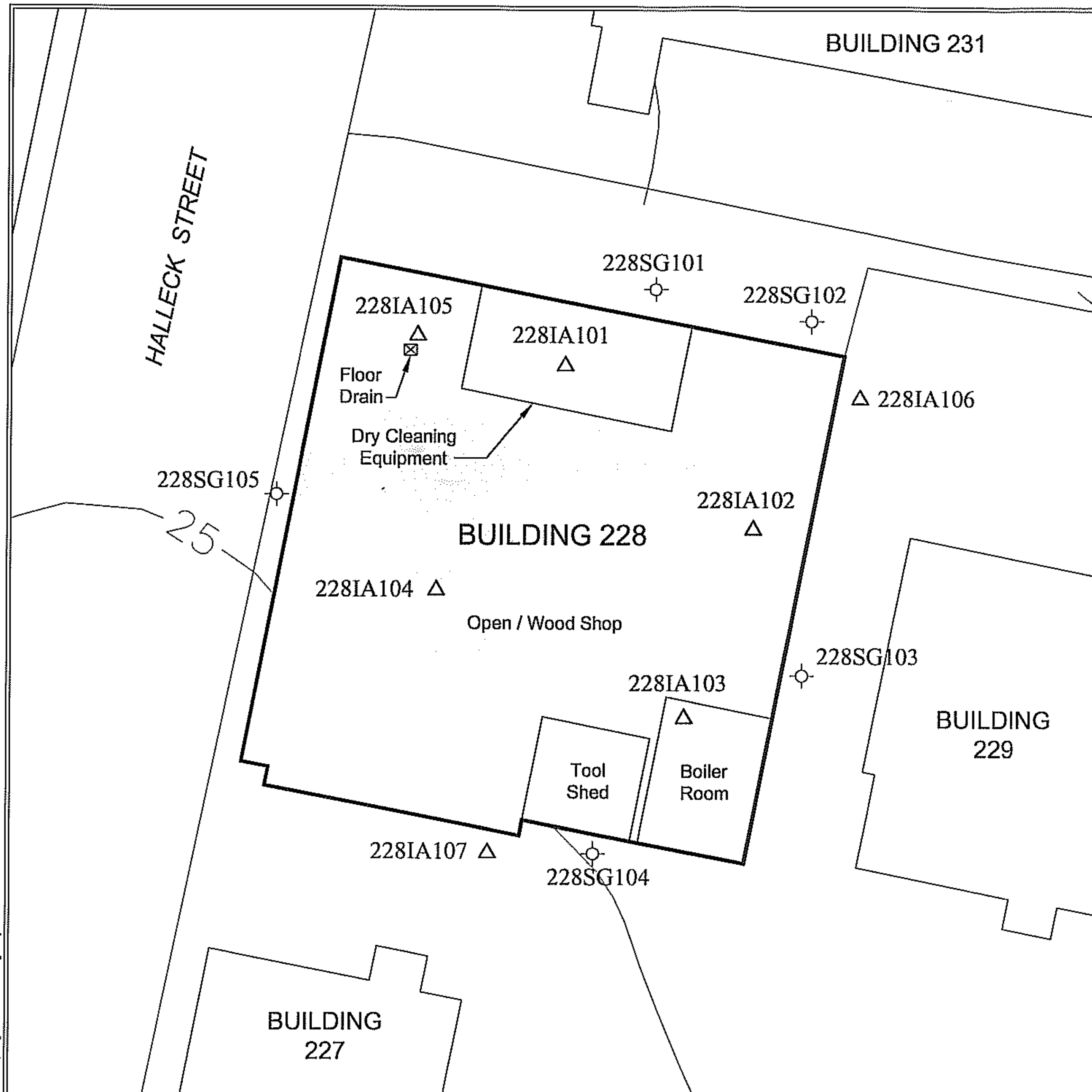
Erler & Kalinowski, Inc.

Site Location Map

Building 228
The Presidio Trust
San Francisco, CA
July 2007
EKI A70004.20

Figure 1

20070705.16043635 G:\A70004.20\Jul07\Bldg 228\Figure 01 - Site Location Map.dwg Layout1



Reference: Basemap source: Presidio Trust, 2006.

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Note:

- Proposed Soil Gas Sampling Location
- Proposed Air Sampling Location

Note:

1. All locations are approximate.

Erler & Kalinowski, Inc.

Proposed Sampling Locations

N

0 20 40

(Approximate Scale in Feet)

Building 228
The Presidio Trust
San Francisco, CA
July 2007
EKI A70004.20

Figure 2

20070705.16101142 G:\A70004.20\Jul07\Bldg 228\Figure 02 - Proposed Sampling Locations.dwg Layout1

Appendix A

Field Methods and Procedures For Soil Gas Sampling and Air Sampling

And

Selected Standard Operating Procedures

from

***Presidio-Wide Quality Assurance Project Plan, Sampling and Analysis Plan.* April 2001**

APPENDIX A

FIELD METHODS AND PROCEDURES FOR SOIL GAS SAMPLING AND INDOOR AND AMBIENT AIR SAMPLING

Building 228, Presidio of San Francisco, California

A-1 Soil Gas Sampling

Soil gas sampling will be conducted generally in accordance with Trust Standard Operating Procedure No. 011, Soil Gas Sampling Methods, found in the Trust QAPP, and the joint Department of Toxic Substances Control ("DTSC") and Regional Water Quality Control Board, Los Angeles Region ("LARWQCB") guidance, entitled *Advisory—Active Soil Gas Investigations* and dated 28 January 2003. Since an onsite mobile lab is planned for this field investigation, samples will be collected in a gas-tight syringe for injection within 30 minutes in the onsite lab gas chromatograph.

To collect soil gas samples, a boring will be advanced by direct push technology to the desired sampling depth, 5 feet below ground surface ("bgs"). Once the desired depth is achieved, a stainless steel implant connected to polyethylene tubing (1/4 or 1/8 inch diameter) will be placed in the bottom of the hole and covered with 6-12 inches of sand. Above the sand, the hole will be filled with hydrated bentonite to create a seal. The sample tubing will protrude through the bentonite to allow collection of the soil gas sample from the implant. Subsurface conditions will be allowed to equilibrate for 30 minutes before purging and sampling in accordance with current state guidelines. A purge volume step test will be conducted for the first soil gas sample in accordance with the state Advisory.

During sampling leak detection compounds, such as 1,1-difluoroethane or tetrafluoroethane, which are found in "dust-off" sprays, will be regularly discharged around all tubing joints where leakage of ambient air into the system could potentially occur. These compounds were selected as the leak detection compounds because they are non-toxic gases that are easily identifiable during analysis and do not occur at contaminated sites. Therefore, it does not interfere with the quantitative analysis of VOCs.

A field duplicate soil gas sample for analysis at a fixed laboratory will be collected from sample location 228SG101 in a six-liter SUMMA canister.

When sampling has been completed, the tubing will be removed and the bentonite will seal the boring. Borings within concrete or asphalt will be repaved upon completion of the work.

A-2.0 Air Sampling

Air samples will be collected in six-liter SUMMA canisters. When the sampling canisters are requested from the laboratory, the sampling duration will be specified so that the laboratory can pre-set the flow controller rates. By providing the appropriate duration to the laboratory, the laboratory can simulate the proper pressure and set flow controllers accordingly. A fixed-flow controller is set to collect 5 liters (L) of sample over the time interval so that a net negative pressure is maintained in the canister. The flow rate for a 6-L canister collecting an 8-hour composite sample would be approximately 13.35 milliliters per minute.

Per Department of Toxic Substances Control ("DTSC") guidance, a trip blank will be submitted for each day of air sampling. An extra evacuated canister will be sent from the laboratory with the canisters in which the air samples will be collected. The trip blank canister will be placed in the building when the other air samples are being collected, but it will remain under vacuum and will be filled by the laboratory after the return of the now full sample canisters. Although the DTSC guidance requires a trip blank, if the trip blank canister fails (i.e., if compounds are detected in the trip blank), it will indicate that the vacuum was fully not maintained on that particular canister; it will not necessarily indicate that any of the other sample canisters have failed.

A-2.1 Indoor Air Sampling

Since the Trust may lease Building 228 to commercial interests, the indoor air samples will be collected over an eight-hour period. Sample locations will be selected based on the subslab sample results, and as discussed with DTSC representatives. Building 228's ventilation and heating systems are not currently operational, so in accordance with the DTSC guidance, the building will be sampled as a sealed building without either system running.

A duplicate indoor air sample will collected at the sample location nearest the area of expected highest VOC concentration.

A-2.2 Ambient Air Sampling

Ambient air samples will be collected in order to provide verification that the laboratory is able to detect low ambient levels of COCs and to help determine how sources outside of Building 228 may impact indoor air quality. Samples will likely be collected near the northeastern and southwestern corners of the building. The samplers will be secured or monitored to prevent disturbance over the course of the sampling period.

Per DTSC guidance to reflect the source air for the building, collection of the two ambient air samples will begin one to two hours before initiation of indoor air sampling. The ambient air samples will also be collected over an eight-hour period.

A-3.0 Disposal of Investigation-Derived Wastes

Wastes generated during the investigations at Building 228 will include gloves and other personal protective equipment. Since the soil gas samples will be collected by direct push technology, no soil residuals are anticipated. Any wastes generated during the sampling event will only be exposed to limited vapor concentrations which are not likely to contain chemicals of concern. Therefore, no hazardous waste residuals are expected from the sampling event.

APPENDIX I

CONFIRMATION SAMPLING PLAN

CONTENTS

FIGURE

I-1.0 INTRODUCTION

This Confirmation Sampling Plan (CSP) has been prepared to describe sampling and laboratory analytical procedures for samples to be collected by MACTEC and Treadwell and Rollo (T&R) in support of environmental corrective action field activities described in the Revised Draft Corrective Action Work Plan (Work Plan) for the Building 207/231 Site (Site) at the Presidio of San Francisco (Presidio), California. Building 228 RU indoor air and soil vapor sampling protocols are presented in Appendix H of the Work Plan.

Sampling and analysis of soil and groundwater at the Site is intended to properly manage materials generated during corrective actions and provide data to verify cleanup levels have been met for chemicals of concern (COCs) identified at each of the five remedial units (RUs) as described in the *Final Corrective Action Plan, Building 207/231 Area Presidio of San Francisco, California* (CAP; *MACTEC, 2007*). Cleanup level exceedances in soil and groundwater are shown on Figures 1-6 and 1-7 of the Work Plan.

This CSP describes field sampling and analytical procedures that will be implemented during the soil and groundwater corrective actions at the Site.

Specifically, this CSP:

- Documents the project sampling design, analytical methods, target analyte lists, practical quantitation limits, and sampling procedures that will be used to collect data to meet the project objectives; and

- Establishes QC and reporting procedures, so that environmental sampling and analysis meet applicable specifications in accordance with the CAP (*MACTEC, 2007*) and the *Presidio-Wide Quality Assurance Project Plan (QAPP), Sampling and Analysis Plan, Presidio of San Francisco, California* (*TetraTech, 2001*).

I-1.1 Scope of Corrective Action Confirmation Sampling

The scope of this CSP is to identify the confirmation sampling procedures and protocols to be followed during implementation of the field components of the corrective actions identified in the Work Plan for the Site that consist of: (1) source removal by excavation of contaminated soils and offsite disposal, (2) in-situ treatment of saturated soils and groundwater; and (3) groundwater monitoring.

Cleanup level exceedances in soil and groundwater are shown on Figures 1-6 and 1-7 of the Work Plan. COCs in soil and groundwater that exceed cleanup levels within each RU are identified in Section I-4.0 (Analytical Methods Summary).

Based on the occurrence of COCs exceeding cleanup levels, the following corrective actions for which confirmation sampling will be implemented were identified for the five soil RUs and four co-located groundwater RUs at the Site:

<u>Excavation</u>

- Former Building 207 Soil RU (Including Former Building 208 sump);

- Former Buildings 38, 38-A, and Garage Area Soil RU;

- Building 231 Soil RU; and
- Building 230 Soil RU.

In-Situ Injection of Oxygen Release Compound and Post-Injection In-Situ Sampling

- Building 228 Soil and Groundwater RU.

Post-Excavation HydroPunch Groundwater Sampling

- Building 230 Soil RU.

Groundwater Monitoring

- Site-wide monitoring of all Groundwater RUs.

I-1.2 Corrective Action Confirmation Sampling Methodology

Confirmation sampling activities that will be conducted as part of the corrective action activities will be guided by the following objectives for (1) excavation; (2) in-situ sampling; and (3) groundwater monitoring as described in the following sections.

I-1.2.1 Excavation Confirmation Sampling Methodology

MACTEC will perform excavation confirmation sampling using the guidelines and methodology described in the bullets below.

MACTEC will obtain analytical data directly from the laboratory and perform a preliminary review (EPA Level II Data Validation, see Section I-6.0) of the chemical data and Quality Assurance/Quality Control (QA/QC) data. The confirmation sample data will be tabulated and compared to the cleanup levels identified for each RU in Table 1-1 of the Work Plan (Soil Cleanup Levels). The data will be presented during weekly meetings with the National Park Service (NPS), Water Board, and other interested stakeholders. If necessary, the Trust will recommend over-excavation strategies in consultation with the NPS and Water Board and implement the overexcavation strategy agreed upon in the meeting. The over-excavation strategies will be documented in the weekly meetings and performed by the Trust's oversight engineer.

MACTEC in collaboration with the Trust, NPS, Water Board, and other stakeholders will determine how much additional soil will be excavated if cleanup levels are exceeded in confirmation samples collected from the excavation floor or sidewalls based on: (1) the type of contaminant; (2) the magnitude of exceedance relative to cleanup level; (3) the results of field monitoring (if applicable to the COC); and (4) other observations made in the field as to the extent of discoloration, soil type, olfactory evidence, extent of debris, etc. Additional excavation will proceed in no less than 1-foot increments.

Confirmation samples will be collected from the over-excavated area at the same frequency as the confirmation soil samples that were collected from the initial excavation. At a minimum, one floor and three sidewall (perimeter of the over-excavation) samples will be collected from the over-excavated area. Soil samples collected from the over-excavated area will be analyzed for the COC suite associated with the chemical(s) that exceeded cleanup levels in the initial soil confirmation sample. For example, if the

initial sample exceeded cleanup levels for lead, then over-excavation samples will be analyzed for metals only.

Figure I-1 (Proposed Excavation Confirmation Sampling Grid) illustrates the Site-wide sampling grid that will be used in the field to identify the soil confirmation sampling locations.

The following guidelines describe in further detail how the confirmation sampling process is anticipated to proceed within the excavation areas.

- If visual observations or photo-ionization detector (PID) readings indicate the presence of contaminated soil in the floor or sidewalls of an excavation, then additional material will be removed until such evidence is no longer present, or until Bay Mud is encountered. Visually contaminated soil may have colors different from the surrounding soil, such as black or green color, or may display a sheen or odor.

- When visual observations or PID readings indicate that contaminated soil has been removed, then confirmation samples will be collected from the floor and sidewalls at the specified frequency and analyzed to confirm that concentrations of COCs are below cleanup levels.

- If laboratory analysis of confirmation samples indicates that no COCs are present in excess of cleanup levels, then no further excavation will be performed on the corresponding floor or sidewall represented by that sample or samples.

- If laboratory analysis of confirmation samples indicates the presence of COCs in excess of cleanup levels, then excavation of the corresponding floor or sidewall will resume. Confirmation samples from expanded excavation areas will only be analyzed for the analytical suite in which the COC detected in the previous confirmation sample exceeded the cleanup levels.

- If laboratory analysis of all corresponding floor and sidewall samples for the expanded excavation indicates that no COCs are present in excess of cleanup levels, or when the excavation cannot be expanded due to the presence of structural constraints and/or limits of the remedial unit identified in the Work Plan, then the excavation will be considered complete.

- If the confirmation samples for the over excavation area exceed the cleanup levels, then MACTEC in collaboration with the Trust, NPS, Water Board, and other stakeholders will determine how much additional soil will be excavated.

- MACTEC in collaboration with the Trust, NPS, Water Board, and other stakeholders will determine the need for collecting additional confirmation samples beyond the minimum specified number of samples. Additional samples may be collected, as necessary, following consultation in weekly stakeholder meetings.

I-1.2.2 In-Situ Confirmation Sampling Methodology

In-Situ Sampling will be conducted after corrective actions have been implemented at the (1) Building 230 RU (post-excavation); and (2) Building 228 RU (post-in-situ injection of oxygen releasing compound) as described in the Work Plan. Concentrations of COCs in soil will be compared to the cleanup levels identified in Table 1-1 of the Work Plan (Soil Cleanup Levels). Concentrations of COCs

in groundwater will be compared to the cleanup levels identified in Table 1-2 of the Work Plan (Groundwater Cleanup Levels).

For the Building 230 RU, MACTEC will collect two groundwater HydroPunch samples after excavation is completed from the excavation bottom prior to backfilling to verify COCs detected in saturated soils above cleanup levels have not impacted groundwater, since groundwater associated with this RU has not been sampled.

For the northern portion of the Building 228 RU where ORC will have been injected during pre-construction activities (see Appendix E), MACTEC will collect 12 soil and groundwater samples two years post-injection after performance monitoring to assess whether COC concentrations detected in saturated soils and groundwater have been reduced below cleanup levels.

T&R will monitor groundwater in New Well 1, down gradient of Building 228 RU, over a two year period following injection of oxygen releasing compound (quarterly for the first year, semiannually for Year 2, and annually from Years 3 to 10) and will collect 10 in-situ soil confirmation samples and 4 in-situ groundwater samples in the ORC remediation area after the two year period. If RU-related COCs occur at concentrations below cleanup levels in New Well 1 following injection, sampling will be ceased at this well.

The following guidelines describe how the in-situ confirmation sampling process is anticipated to proceed to assess the effectiveness of the corrective actions.

- After the corrective action has been implemented, in-situ confirmation samples will be collected from the area using direct push technology (DPT) sampling methods at the specified frequency and analyzed to confirm that concentrations of COCs are below cleanup levels.

- If no COCs are present in excess of cleanup levels, then no further corrective actions will be performed on the area represented by that sample or samples, and the corrective action for the area will be considered complete.

The need for additional injection or implementation of other technologies consistent with mitigating or preventing migration of groundwater containing COCs above cleanup levels will also be assessed. Details regarding the need for, implementation, and duration of these contingencies would be described in a supplemental report based on the results of post-injection groundwater monitoring and DPT confirmation sampling. If sampling results indicate concentrations of COCs are below cleanup levels, it is assumed that ‘clean closure’ of this portion of the Building 228 RU would be obtained.

I-1.2.3 Groundwater Confirmation Sampling Methodology

Groundwater Monitoring will be conducted as summarized in Table 2-1 of the Work Plan (Summary of Groundwater Monitoring and Well Abandonment Program) by the Trust’s subcontractor (Treadwell & Rollo) under the existing *Semi-Annual Groundwater Monitoring Report, Presidio-Wide Quarterly Groundwater Monitoring Program*. Concentrations of COCs in groundwater will be compared to the cleanup levels identified in Table 1-2 of the Work Plan (Groundwater Cleanup Levels).

The following guidelines describe how the groundwater monitoring process is anticipated to proceed for the Site-wide network of monitoring wells to assess the effectiveness of the corrective actions.

- If results of laboratory analysis indicate that COCs are below cleanup levels in groundwater for four consecutive quarters in the first year of monitoring, then the sampling frequency will change to semi-annual and the monitoring will continue for two additional years.

- If results of laboratory analysis indicate that COCs are below cleanup levels for four consecutive semi-annual monitoring events following the first year of sampling, the monitoring program will be discontinued, and the remedial action will be considered complete.

- If in the first year of monitoring groundwater does not meet cleanup levels for COCs for four consecutive quarters, then quarterly sampling will continue for up to two years.

- If after up to three years of monitoring, COCs are above cleanup levels in the groundwater samples, the data will be assessed in accordance with the groundwater monitoring program identified in the Work Plan.

I-2.0 SAMPLE PROCESS DESIGN

This section describes the types of samples to be collected, the sample measurement parameters, and the sample collection process.

I-2.1 Sample Types

Soil and groundwater are the media to be sampled during the project. Field samples and quality assurance /quality control (QA/QC) samples will be generated. Field samples include excavation confirmation samples, soil stockpile samples, and groundwater samples collected from down gradient wells. QA/QC samples are duplicate samples submitted to the laboratory as control elements to verify the accuracy and consistency of analytical results and equipment rinsate samples collected to document the effectiveness of equipment decontamination methods. QA/QC sampling procedures are described further in Section I-6.0 (Quality Control Requirements).

I-2.2 Sample Measurement Parameters

The remedial unit (RU) specific analytical methods are summarized in Section I-4.0 (Analytical Methods Summary), and for waste profiling in Section I-5.0 (Investigation-Derived Waste).

I-2.3 Sample Collection Process

The sample collection process to be followed during corrective actions for each of the five RUs are described in the following sections.

I-2.3.1 Sample Collection Process—Former Building 207 Remedial Unit (Including Former Building 208 Sump)

Two excavations are anticipated at the Former Building 207 RU: within the Former Building 207 Area, and the Former Building 208 Sump Area. As shown on Figure I-1 (Proposed Excavation Confirmation Sampling Grid), a 25- by 25-foot sampling grid will be used to guide the collection of excavation floor (bottom) and sidewall samples. Based on the estimated excavation areas, the following confirmation samples are anticipated to be collected:

- **Floor sampling –** The estimated surface area of the floor of the Former Building 207 Area is approximately 10,000 square feet (sf); one floor sample will be collected per 625 sf (25- by 25-foot). The estimated surface area of the floor of the Former Building 208 Sump Area is approximately 300 sf; a minimum of one floor sample will be collected. If the excavation area exceeds 625 sf, one additional floor sample will be collected per 625 sf (25- by 25-foot).

- **Sidewall sampling –** The excavation sidewalls will be sampled at the midpoint of their height every 25 feet of the excavation's lateral extent. A minimum of one sidewall sample will be collected from each side of the excavations.

- **Groundwater sampling –** Two monitoring wells will be installed down gradient of this RU (New Wells 3 and 4). Following excavation activities, the wells will be sampled in accordance with the groundwater monitoring program described in the Work Plan.

T&R will install and develop the new wells, New Well 3, and New Well 4, following the guidelines set forth in the Presidio-Wide Quality Assurance Project Plan (QAPP); [*Tetra Tech, 2001*] SOP No. 004 and 005 specifically; Appendix F); specifically, it will be installed using a hollow-stem auger rig, constructed with 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing, and a 2-inch diameter 0.010 slotted casing with 2/12 sand.

New Well 3 and New Well 4 are anticipated to be both screened from approximately 5 to 20 feet bgs, respectively. However, the actual screen intervals will be determined following completion of excavation and in consultation with the NPS, Trust, Water Board, and other stakeholders. The location and elevation will be surveyed by a licensed land surveyor to within ±0.01 foot accuracy in accordance with survey requirements in Section 3.1.8 of the Work Plan.

I-2.3.2 Sample Collection Process—Former Building 38, 38-A and Garage Area Remedial Unit

Two excavations are anticipated at the Former Building 38 RU, on the southern and northern sides of the Doyle Drive overpass structure. As shown on Figure I-1 (Proposed Excavation Confirmation Sampling Grid), a 25- by 25-foot sampling grid will be used to guide the collection of excavation floor (bottom) and sidewall samples. Based on the estimated excavation area at the Former Building 38 RU, the following confirmation samples are anticipated to be collected:

- **Floor sampling –** The estimated surface area of the floors of the excavations are approximately 300 and 600 sf. A minimum of one floor sample will be collected within each of the excavations. If the excavations exceed 625 sf, a 25- by 25-foot sampling grid will be used to guide collection of excavation bottom samples.

- **Sidewall sampling –** The excavation sidewalls will be sampled at the midpoint of their height every 25 feet of the excavation's lateral extent. A minimum of one sidewall sample will be collected from each side of the excavations.

- **Groundwater sampling –** T&R will install two monitoring wells down gradient of this RU (New Wells 5 and 6). Screen intervals are anticipated to be from approximately 5 to 20 feet bgs. Actual screen intervals will be determined following completion of excavation and in consultation with NPS, Trust, Water Board, and stakeholders. Following excavation activities, the wells will be sampled in accordance with the groundwater monitoring program described in the Work Plan.

I-2.3.3 Sample Collection Process—Building 231 Remedial Unit

One excavation is anticipated at the Former Building 231 RU. As shown on Figure I-1 (Proposed Excavation Confirmation Sampling Grid), a 25- by 25 foot sampling grid will be used to guide the collection of excavation floor (bottom) and sidewall samples. Based on the large size of the estimated excavation area at the Building 231 RU, the following confirmation samples are anticipated to be collected:

- **Floor sampling –** The estimated surface area of the floor of the excavation is approximately 28,000 sf; one floor sample will be collected per 625 sf (25- by 25-foot).

- **Sidewall sampling –** The excavation sidewall will be sampled at the midpoint of its height every 25 feet of its lateral extent.

- **Groundwater sampling –** T&R will install one monitoring well down gradient of this excavation (New Well 2). Screen interval is anticipated to be from approximately 5 to 20 feet bgs. Actual screen intervals will be determined following completion of excavation and in consultation with NPS, Trust, Water Board, and stakeholders. Following excavation activities, the well will be sampled in accordance with the groundwater monitoring program described in the Work Plan.

I-2.3.4 Sample Collection Process—Building 230 Remedial Unit

One excavation is anticipated at the Former Building 230 RU. As shown on Figure I-1 (Proposed Excavation Confirmation Sampling Grid), a 25- by 25-foot sampling grid will be used to guide the collection of excavation floor (bottom) and sidewall samples. Based on the estimated excavation area at the Building 230 RU, the following confirmation samples are anticipated to be collected:

- **Floor sampling –** The estimated surface area of the excavation floor is approximately 1,800 sf; one floor sample will be collected per 625 sf (25- by 25-foot).

- **Sidewall sampling –** The excavation sidewall will be sampled at the midpoint of its height every 25 feet of its lateral extent.

- **Groundwater sampling –** After excavation is complete, soil confirmation samples have been collected, and prior to backfilling, HydroPunch groundwater samples will be collected to the north and south of the excavation limit to verify there are no residual groundwater impacts in the area of this RU. Following the HydroPunch sampling, the existing monitoring well down gradient of this excavation (231GW11) will be sampled in accordance with the groundwater monitoring program described in the Work Plan.

I-2.3.5 Sample Collection Process—Building 228 Remedial Unit

The corrective action for the northern portion of the Building 228 RU includes in-situ injection of an oxygen release compound (ORC). The following confirmation samples are anticipated to be collected from within this RU after implementation of the corrective action, and will be described and documented in a Letter Report or Addenda to the Construction Completion Report, depending on the implementation schedule:

- **Groundwater sampling –** A monitoring well will be installed down gradient of the ORC injection area (New Well 1) one month prior to ORC injection and three months prior to initiation of excavation activities. One round of baseline sampling will be conducted approximately two months prior to ORC injection. Post remediation sampling (quarterly during the first year, semi-annual during year 2, and annual during years 3 to 10) will be conducted at this well. If RU related COCs reduce below cleanup levels in this well following injection, sampling will be ceased at this well.

- **In-Situ soil and groundwater sampling –** The effectiveness of the in-situ injection of oxygen release product in reducing groundwater COCs below cleanup levels will be assessed (1) during groundwater monitoring of down gradient wells for COCs over a 2-year period following injection, and (2) after the 2-year period by collecting 10 in-situ soil confirmation samples and 4 in-situ groundwater confirmation samples using direct push technology.

An assessment of potential vapor phase intrusion to indoor air, assessment of the indoor cap will be performed by EKI along with the ORC injection proposed for Building 228. The assessment will be

implemented in accordance with DTSC/Cal EPA's *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, December 15, 2004, revised February 7, 2005. The plan for this assessment is included in Appendix H of the Work Plan. The results of the assessment and corrective actions implemented, if necessary, are documented in the Construction Completion Report.

The ORC field activities will be described in the Construction Completion Report. The post remediation groundwater monitoring to be conducted by T&R will be reported in the Semi Annual Groundwater Monitoring Reports by T&R. For the confirmation sampling to be conducted in the ORC remedial area approximately two years after injection, MACTEC will prepare a Work Plan prior to the field work and a report describing the confirmation sampling after completion of the field work for approval by the Water Board and the stakeholders.

I-3.0 SAMPLING METHOD REQUIREMENTS

Sampling procedures will be performed in accordance with protocols described in detail in the QAPP, and summarized in the following sections.

I-3.1 Sample Collection

Confirmation samples will be collected in accordance with the Presidio Trust Standard Operating procedures (SOPs), specifically SOP No. 001 of the QAAP (*TetraTech, 2001*) (SOPs can be found in Appendix F of the Work Plan). Confirmation soil samples will be collected from excavation floors and sidewalls at the frequencies described above using a drive-sampler lined with stainless-steel sample tubes, an EnCore sampler or another 5035 approved sampling product, or from a backhoe bucket, depending on field conditions, accessibility, and analytical container requirements. If samples are collected from a backhoe bucket, the sample collector will direct the operator and observe the process as the bucket is filled to verify that the material is representative of in-situ soil from the targeted sample location. A sample tube will be pushed or driven sufficiently into the soil in the bucket so the sample tube is completely filled to minimize voids or headspace that may contribute to subsequent volatilization of COCs. Following collection, sample containers will be appropriately sealed and submitted to the analytical laboratory for analysis of COCs as described in Section I-3.0 (Sampling Method Requirements).

Discrete samples will be collected from excavated stockpiled soil or imported backfill using a hand sampler, backhoe bucket, or following the protocols described above. In situ samples will be collected using best available direct push technology (DPT) sampling methods specific to the equipment selected, and will be described in the Construction Completion Report.

A licensed land surveyor under contract with the excavation contractor will survey the confirmation sample locations; these locations will be presented by the land surveyor on the excavation record survey map, which will document the topographic condition following the completion of excavation.

Groundwater samples will be collected during monitoring as summarized in Table 2-1 of the Work Plan (Summary of Groundwater Monitoring and Well Abandonment Program). Groundwater samples will be collected in accordance with groundwater sampling procedures described in the QAPP and the Trust's *Semi-Annual Groundwater Monitoring Report, Presidio-Wide Quarterly Groundwater Monitoring Program*. Samples will be collected in containers appropriate for the analyses requested, and submitted to the laboratory for evaluation of COCs as described in Section I-3.0 (Sampling Method Requirements).

I-3.1.1 Sampling Equipment Decontamination

Decontamination of all reusable sampling equipment will be performed before initial use onsite and between each use at discrete sample locations. Decontamination will be performed in accordance with specifications in the QAPP. MACTEC's field crew will be provided copies of the specific sections of the QAPP that document the procedures to be followed for equipment decontamination.

I-3.2 Sample Documentation and Handling

The excavation contractor and Engineering field personnel are responsible for documentation of field activities, conditions, sample locations, labeling, packaging, storage, handling, and shipping, if applicable, of samples collected in the field. These practices are necessary to maintain the integrity of the sampling

process and the sample from initial collection through reporting. The following sections describe the documentation and handling processes that will be used.

I-3.2.1 Sample Labels

All samples will be appropriately labeled so they can be identified and correlated with the source location. Information will be printed legibly with waterproof ink. The label must contain sufficient information so that the sample can be correlated with field logs, sample collection logs, and chain-of-custody forms. Each sample label will contain the following information:

- Project name;
- Unique sample identifier as described in Section I-3.2.2 (Sample Numbering System);
- Date and time of sample collection;
- Remarks as needed; and
- Initials or name of the sampler.

I-3.2.2 Sample Numbering System

Every sample collected will carry a unique identification number. The sample designation will facilitate data management by referencing sample type, location and the depth. Identification numbers consist of an alphanumeric code that sequentially provides the appropriate reference information in the format of site designation, sample type, three-digit numerical sequence of sample, and depth below ground surface in brackets.

Excavation Confirmation Samples:

For example, the sample identification number 231EX100[5] would refer to the following:

- 231 – The sample is from the Building 231 Area.
- EX – The sample source location is the excavation and it is an excavation confirmation sample.
- 100 – The unique sequential sample number for this sample is 100. The project sample numerical sequence will begin with sample number 100, which indicates that this was the first field sample collected for the project.
- [5] – The sample was collected from a location within the excavation that was at a depth of 5 feet below the previous ground surface, the previous ground surface will be determined using reference stakes that were set up prior to the excavation.

HydroPunch Samples:

For example, the sample identification number 230HP100[15] would refer to the following:

- 231 – The sample is from the Building 230 Area.

- HP – HydroPunch.
- 100 – The unique sequential sample number for this sample is 100. The project sample numerical sequence will begin with sample number 100, which indicates that this was the first field sample collected for the project.
- [15] – The sample was collected at a depth of 15 feet below ground surface.

Soil Boring Samples:

For example, the sample identification number 230SB100[15] would refer to the following:

- 230 – The sample is from the Building 230 Area.
- SB – Soil Boring.
- 100 – The unique sequential sample number for this sample is 100. The project sample numerical sequence will begin with sample number 100, which indicates that this was the first field sample collected for the project.
- [15] – The soil sample was collected at a depth of 15 feet below ground surface.

Backfill Sample:

For example, the sample identification number 231BC100 would refer to the following:

- 231 – The sample is from the Building 231 Area.
- BC – Backfill Composite
- 100 – The unique sequential sample number for this sample is 100. The project sample numerical sequence will begin with sample number 100, which indicates that this was the first field sample collected for the project.

Extracted Water Sample:

For example, the sample identification number 231DE100 would refer to the following:

- 231 – The sample is from the Building 231 Area.
- DE– Dewatering Sample
- 100 – The unique sequential sample number for this sample is 100. The project sample numerical sequence will begin with sample number 100, which indicates that this was the first field sample collected for the project.

Duplicate Samples:

Duplicate samples and trip blanks will have the source code (“DUP” or “TB”, as appropriate) followed by the date. For example, sample number DUP021507 indicates a duplicate sample that was collected on

February 15, 2007. MACTEC and the Trust will confirm that each duplicate sample collected in the field has a unique identification number. If more than one duplicate is collected on a single date, then the sample number will also include the suffix “-1”, or “-2”, etc., to differentiate the duplicate samples from that day (e.g., DUP021507-2 indicates the second of two duplicate samples collected on that date). Field logs and sample collection logs will also indicate the source location of the duplicate sample for correlation purposes.

Equipment Blank Samples:

Equipment blanks will include the number of the primary sample collected, followed by the designation “RB”, in turn followed by the number of the primary sample collected after the equipment blank is collected. For example, an equipment blank collected after the collection of sample number 231EX100[5], would have the sample number 231EX100RB101, indicating that it was collected between samples 100 and 101. Note that an equipment blank collected after the last primary sample of the day would not have a following sample designation and would end with “RB” (e.g., 231EX100RB).

Prior to field mobilization, MACTEC will prepare a sampling and analysis plan, which includes a list of samples and sample identification number for approval by the Trust’s database manager.

I-3.2.3 Sample Packaging and Shipping

After collection and labeling, samples will be placed in refrigerated containers and transported to the analytical laboratory by the laboratory courier, or shipped through a parcel delivery service, depending on the location of the laboratory. The following steps will be taken before the sample containers are transported.

- Make sure all sample container caps are tight;
- Place samples in sealed, water-tight plastic bags;
- Place enough ice in samples to maintain samples at 4 degrees C or less; and
- Place sufficient packing material in the container to minimize the potential for breakage of samples.

The chain-of-custody form will be appropriately signed by the Engineer relinquishing the samples and the laboratory personnel receiving the samples. If samples are to be shipped via a parcel delivery service, the following steps will also be taken:

- Place the top page of each chain-of-custody form in a sealed clear plastic envelope in the cooler; and
- Secure the container closure and place a custody seal over the container lid.

I-3.2.3.1 Chain of Custody Documentation

Sample chain-of-custody documentation must be complete and thoroughly maintained from initial sampling to completion of analysis and reporting to verify sample integrity. Documentation procedures will be in accordance with the protocols described in the QAPP, and will include all required information. Documentation will also include acceptance and relinquishment signatures for all persons through whose custody the samples have passed.

I-3.3 Quality Assurance and Quality Control Sampling

QA/QC samples will be included in this project to support the data quality objectives presented in Section I-2.0 (Sample Process Design). The sampling methodologies, preservation techniques, and decontamination procedures have been selected to confirm appropriate data quality. In order to meet project objectives, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of approximately 10 percent of the total number of samples generated for each removal activity. For groundwater samples collected from wells, or for soil samples that are collected in sample tubes and EnCore type samplers, MS/MSD additional sample volumes will be generated by collecting two additional sample volumes from the designated sample points.

In accordance with the QAPP, the equipment blank samples will be collected each sampling day, but not to exceed 10 percent of the total number of primary samples. MACTEC will maintain a sample tracking form (included in Appendix G), which tracks all the samples collected (primary and QC samples) and the equipment blank samples. The tracking will allow MACTEC to confirm that the QAPP requirements are met.

Trip blanks will be submitted at a frequency of one per shipped sample container containing groundwater samples, not to exceed 10 percent of the total number of primary water samples.

I-4.0 ANALYTICAL METHODS SUMMARY

This section lists the analytical suites for the proposed work at each of the Soil and Groundwater RUs identified at the Site. Samples will be submitted to an analytical laboratory that is State-certified for the analyses requested.

I-4.1 Analytical Methods—Former Building 207 Remedial Unit (Including Former Building 208 Sump)

The soil confirmation samples collected from the Building 207 RU will be analyzed for the analytical suite associated with each COC previously determined to exceed cleanup levels in the vicinity of the confirmation sample, including the following analytes:

- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Lead);
- MTBE and BTEX by EPA Test Method 8260B; and
- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline, diesel, and fuel oil).

The soil confirmation samples collected from the Former Building 208 Sump RU will be analyzed for the full analytical suite associated with each COC including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline [C7 to C12], diesel [C12 to C24], and fuel oil [C24 to C36]). TPH diesel and fuel oil analysis will be conducted using silica gel cleanup.
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Lead and Zinc).
- PAHs by EPA Test Method 8270SIM (benzo(a)pyrene).

The groundwater confirmation samples collected from the Building 207 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline [C7 to C12]);
- MTBE and BTEX by EPA Test Method 8260B;
- PAHs by EPA Test Method 8270SIM (which includes the COCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene);
- Redox and DO by direct reading field measurement; and
- General water quality parameters by various methods.

I-4.2 Analytical Methods—Former Building 38, 38-A, and Garage Area Remedial Unit

The soil confirmation samples collected from the Building 38 RU will be analyzed for the analytical suite associated with each COC previously determined to exceed cleanup levels in the vicinity of the confirmation sample, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as diesel and fuel oil using silica gel cleanup);
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Arsenic, Lead and Zinc); and
- PAHs by EPA Test Method 8270SIM (which includes the COCs anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene).

The groundwater confirmation samples collected from the Building 38 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- VOCs by EPA Test Method 8260B (which includes the COC toluene and vinyl chloride);
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Arsenic and Nickel);
- PAHs by EPA Test Method 8270SIM (which includes the COCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, chrysene and indeno(1,2,3-cd)pyrene);
- Redox and DO by direct reading field measurement; and
- General water quality parameters by various methods.

I-4.3 Analytical Methods—Building 231 Remedial Unit

The soil confirmation samples collected from the Building 231 RU will be analyzed for the analytical suite associated with each COC previously determined to exceed cleanup levels in the vicinity of the confirmation sample, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline, diesel and fuel oil using silica gel cleanup).
- VOCs by EPA Test Method 8260B (which includes the COCs BTEX, Methylene chloride (MeCl), PCE, and vinyl chloride);
- Title 22 Metals by EPA Test Method Series 6010/6020-70 (which includes the COCs arsenic, chromium, cobalt, lead, mercury, nickel, silver, and zinc);
- PAHs by EPA Test Method 8270SIM (which includes the COCs benzo(a)pyrene, benzo(b)fluoranthene, and benzo(b+k)fluoranthene); and

- Pesticides and PCBs by EPA Test Method 8081A and 8082 (which includes the COCs 4,4'- DDT and Arochlor 1016).

The groundwater confirmation samples collected from the Building 231 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline, diesel, and fuel oil);
- VOCs by EPA Test Method 8260B (which includes the COC BTEX, bromobenzene, 1,2-DCA, PCE, and TCE);
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Lead, vanadium, zinc, and Nickel);
- PAHs by EPA Test Method 8270SIM (which includes the COCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, benzo(k)fluoranthene, and chrysene);
- PCBs by EPA Test Method 8082 (which includes the COC Arochlor 1016);
- Redox and DO by direct reading field measurement; and
- General water quality parameters by various methods.

I-4.4 Analytical Methods—Building 230 Remedial Unit

The soil confirmation samples collected from the Building 230 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as diesel and fuel oil using silica gel cleanup);
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Lead); and
- PAHs by EPA Test Method 8270SIM (which includes the COCs acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, and pyrene).

The groundwater confirmation samples collected from the Building 230 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as diesel, and fuel oil);
- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (Lead);
- PAHs by EPA Test Method 8270SIM (which includes the COCs acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b+k)fluoranthene, and pyrene);
- Redox and DO by direct reading field measurement; and

- General water quality parameters by various methods.

I-4.5 Analytical Methods—Building 228 Remedial Unit

The soil confirmation samples collected from the Building 228 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline, diesel and fuel oil using silica gel cleanup); and

- VOCs by EPA Test Method 8260B (which includes the COCs ethylbenzene and xylenes).

The groundwater confirmation samples collected from the Building 228 RU will be analyzed for the full analytical suite associated with each COC, including the following analytes:

- TPHs by EPA Test Method 8015 with specified carbon range (which includes TPH as gasoline, diesel, and fuel oil);

- VOCs by EPA Test Method 8260B (which includes the COCs ethylbenzene, 1,2-dichlorobenzene, and xylenes);

- Title 22 Metals by EPA Test Method Series 6010/6020-7000 (which includes COCs nickel and arsenic[for a minimum of one year]);

- Redox and DO by direct reading field measurement; and

- General water quality parameters by various methods.

I-4.6 Excavation Waste Profiling

Excavated soil will require sampling and analysis to fulfill profiling and characterization requirements of the appropriately-licensed landfills or recycling facilities at which the material will be disposed. Sampling frequencies and analyses will be based on the requirements of the disposal facility, but will include, as a minimum, analysis for all site COCs.

I-5.0 INVESTIGATION-DERIVED WASTE

For sampling to be conducted during soil excavation (i.e., confirmation sampling and stockpile sampling), the sampling related waste will be placed in the soil stockpiles and disposed off-site along with the excavation spoils. Decontamination, purge, or equipment rinsate water generated during soil removal activities will be transferred to the onsite storage tanks (Baker tanks) used to store extracted groundwater. The discharge of extracted water from the tanks will be handled in accordance with Appendix C of this Work Plan.

For in-situ and groundwater sampling to be conducted prior to and after completion of excavation activities, the IDW generated will be contained and sealed in 55-gallon drums and transferred to the Central Magazine area, where it will be profiled. Soil waste will be transported off-site to appropriate landfill facilities and groundwater (provided it meets Trust's industrial wastewater permit requirements) will be discharged into the sanitary sewer system.

I-6.0 DATA VALIDATION AND DATA MANAGEMENT

MACTEC will obtain analytical data directly from the laboratory and will perform a cursory review of the chemical data (EPA Level II validation) and QA/QC data prior to consulting with the Trust and agencies regarding the need to continue excavation or begin backfilling. The purpose of the cursory review is to identify any significant QC failures or elevated detection limits that would affect decisions regarding whether the data are sufficient to show that COCs are not present in confirmation soil samples at concentrations greater than cleanup levels. Preliminary analytical data will be screened against cleanup levels and cleanup level exceedances identified. Tables of preliminary data will be prepared and presented in weekly stakeholder meetings.

Level III and Level IV data validation will be performed after hard copies of comprehensive certificate of analysis (CCA; Level III) and the raw data packages (Level IV) are received from the laboratory. Validation will be performed and qualifiers will be applied to analytical results in accordance with the Presidio-Wide Quality Assurance Project Plan, U.S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Organic Data Review, and U.S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Raw data packages (Level IV) will be provided for at least 10 percent of the samples analyzed. The results of the Level III and Level IV data validation will be presented in the Construction Completion Report.

The backfill samples (to be used for backfilling excavations) will also be subject to similar data validation protocol to that for the confirmation samples.

Pertinent chain of custody information and analytical data (obtained electronically from the laboratory) will be loaded into MACTEC's database and the Presidio's database. Survey data (northing and easting coordinates) for the confirmation samples and data validation qualifiers will also be loaded into both databases. Database reports of Level III validated analytical data will be generated from MACTEC's database for presentation in the Construction Completion Report.

I-7.0 REFERENCES

MACTEC Engineering and Consulting, Inc. (MACTEC), 2006. *Corrective Action Plan, Building 207/231Area, Presidio of San Francisco, California*. September.

_____, 2007. Final Corrective Action Plan, Building 207/231 Area, Presidio of San Francisco, California.

TetraTech, 2001. *Presidio-Wide Quality Assurance Project Plan (QAPP), Sampling and Analysis Plan, Presidio of San Francisco, California*. April.

U.S. Environmental Protection Agency (EPA), 1994. *National Functional Guidelines for Inorganic Data Review*.

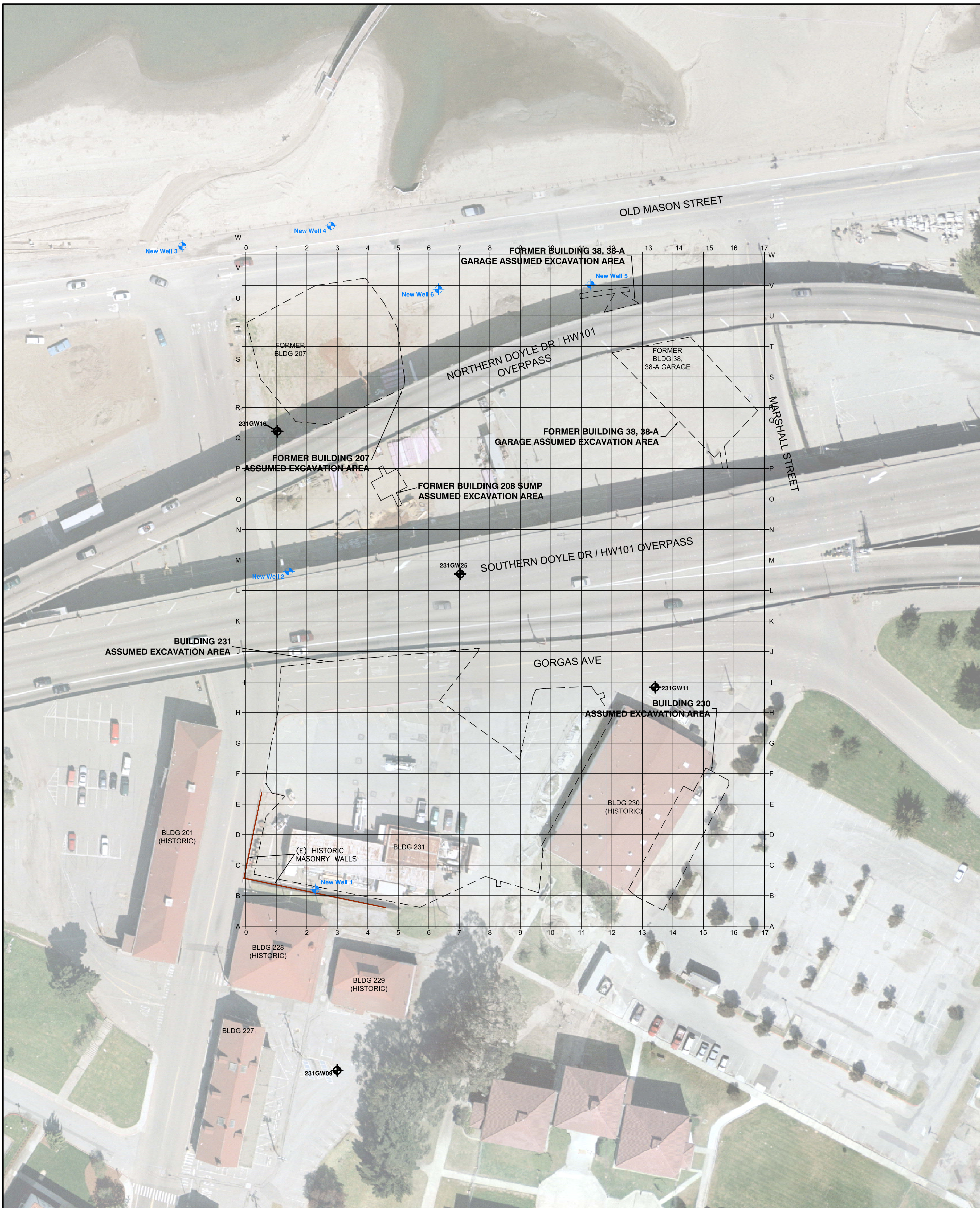
____, 1997. *Test Methods for Evaluating Solid Waste, Third Edition (Update III). SW- 846.*

____, 1999. *National Functional Guidelines for Organic Data Review*.

____, 2000. *Guidance for the Data Quality Objectives Process, Final. QA/G-4, EPA/600/12-96/055*.

APPENDIX I

FIGURE



LEGEND

PROPOSED MONITORING WELL — New Well 1

EXISTING MONITORING WELL RETAINED — 231GW09

HISTORIC WALL

TOPOGRAPHIC CONTOUR — 24

ASSUMED EXCAVATION AREA

PROPOSED SAMPLING GRID
(SAMPLING GRID IS SPACED IN 25 FOOT
INCREMENTS FOR ALL EXCAVATION AREAS) — B, A, 0, 1, 2

N

40 0 40 80
SCALE IN FEET

4084075106031.DWG 1.0
20071019.1101

MACTEC

PROPOSED CONFIRMATION SAMPLING GRID
PRESIDIO BUILDING 207/231
PRESIDIO SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE:
I-1

DRAWN	JOB NUMBER	CHECKED	CHECKED DATE	APPROVED	APPROVED DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

APPENDIX J

SANITARY SEWER AND
PROPAGULE PLANTING AREA DRAINAGE DESIGN

CONTENTS

TABLES

FIGURES

ATTACHMENTS

J1.0 DESIGN FOR TEMPORARY SANITARY SEWER REROUTE

This memorandum presents the design basis, assumptions, and calculations performed to complete the design of the following features:

1. Temporary Sanitary Sewer Reroute Around the Project Site

2. Propagule Planting Area Drainage

J1.1 Sewage Loading

Known Sewage Loading: 380 gallons per day (gpd) (0.3 gallons per minute [gpm]). See attached Table J-1.

Maximum Potential Sewage Loading (If all Buildings Occupied): 25,833 gpd (17.9 gpm).

J1.2 Change in Elevation:

From Manhole to the southwest of Building 230 to Edie Road Trunk Line (Less than 10 feet).

J1.3 Pump

Capable of 17 feet at 20 gpm to 15 feet at 40 gpm (see attached SKV-40), which is capable of providing the required head and flow rate (please see Attachment 1).

J2.0 PROPAGULE PLANTING AREA DRAINAGE DESIGN

J2.1 Existing Data Used to Conduct Design

J2.1.1 Groundwater Levels, Shallow Zone Wells, Building 231 RU Area

1. Historical Groundwater Data from Shallow Wells (see Figure J-1 for locations of shallow zone wells).

2. Historic Groundwater Level Hydrographs for Shallow Zone Wells (Figure J-2 depicts data from May 2001 through May 2006).

3. Historic High Groundwater Level Data used to plot historic high groundwater potentiometric surface. The surface contours range from 11.6 feet to 9 feet NAVD 88 elevation (see Figure J-1).

4. Groundwater levels are at their highest elevation during March and May sampling events (see Figures J-2, J-3, and J-4).

J2.1.2 Proposed Finish Surface Elevation

1. Proposed Finish Grade Elevations, except along the embankment slopes on the south, west, and east sides of Building 231 RU, range from 9 feet NAVD 88 to 11 feet NAVD 88 (see Figure J-1).

2. Typical finish grade elevations are 0.5 foot to 1 foot below historic high groundwater elevations (see Figure J-1).

3. Cost Differential is approximately $44,000 to raise the finish surface elevation to historic high elevation (see Attachment 2).

4. For majority of the year, except in spring and early summer, the finish surface elevations are above the groundwater elevations.

J2.1.3 Tide Data

1. Tide Station in Crissy Field (www.noaa.gov) (see Figure J-5).

2. Tidal Fluctuations Relative to NAVD 88 (www.noaa.gov) (see Figure J-6).

J2.1.4 Precipitation Data

1. Rainfall characteristics used in the design include:

   - Intensity (rate of rainfall)

   - Duration (time rainfall lasts), and

   - Frequency (statistical probability of how often rainfall will occur).

Northern California's climate is characterized by long, dry summers and mild wet winters. Most of the annual precipitation occurs from November through March, with little or no rainfall from May through October. The rainfall intensity of the 100-yr, 6-hour storm was determined for the site location based on historical data from the nearest rain gage (0.41 inches per hour). The rainfall data were acquired from the National Oceanic and Atmospheric Administration website:

http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm.

The precipitation-frequency data output is presented as Attachment 3.

J2.2 Volume of Surface Expression of Groundwater and Storm Water

Drainage to be provided to drain the surface water from the Building 231 RU area through the installed drain inlet and storm drain pipe into the existing 72-inch main storm drain line (see J-1 for plan view and Figure 3-4 of the Work Plan for cross-sectional view).

The cross-sectional view shows the drain inlet elevation at the discharge end of the storm drain pipe and at the tie-in to the 72-inch main line to be approximately 6 feet relative to NAVD 88 datum. As such, with a factor of safety of 1.2, the elevation of the storm drain line at the connection point is 5 feet relative to NAVD 88 datum.

The tide elevations range from greater than 7 feet to less than -2 feet NAVD 88 elevation. During high tides, the water drains back into the 72-inch main storm drain line and toward the Site. The high tide elevation is higher than the elevation of the discharge end of the storm drain line installed on site.

From the attached tide chart, typically for 5 hours of the day, the tide elevation is higher than 5 feet relative to NAVD datum, which is the elevation of the storm drain pipe at the tie-in location. A check valve to be placed in the storm drain pipe to prevent tidal backflow into the Building 231 RU area.

J2.2.1 Volume of Surface Water Collected During High Tide

1. Surface Expression of Storm Water:

   Quantity of Water = Precipitation Intensity (inches/hour) x (1 foot/12 inches) x (Drainage Area in square feet) x Period during which tide elevation exceeds 5 feet relative to NAVD 88 (see Attachment 4).

   <u>Volume of surface expression of storm water = 4,766 cubic feet.</u>

2. Groundwater Expression as Surface Water:

   Quantity of Water = (Drainage Area in square feet) x Difference between historic high groundwater elevation and finish surface (the upper end of the range, i.e., 1 foot is conservatively chosen for calculations) (see Attachment 4).

   <u>Volume of surface expression of ground water = 27,900 cubic feet.</u>

   Total Volume of Surface Water = 4,766 + 27,900 = 32,666 cubic feet

J2.3 Design of Storm Drain Pipe Transferring Storm Water from Drain Inlet into the 72-Inch Main Line

1. Storm Drain Pipe Design

   - Plastic Pipe
   - 12-inch diameter
   - 0.5% slope
   - Flow Rate, Capacity = Manning's Velocity x Area of Pipe (see Reference 2 for Manning's coefficient for Plastic Pipe)
   - Flow Rate = 3.63 cubic feet per second (see Attachment 5).

2. Number of Hours Required to Drain the Drainage Area

   - Total Volume of Surface Water/ Flow Rate in Storm Drain Pipe = 2.7 hours

As the tide levels are below the bottom of the storm drain pipe discharge elevation of 5 feet NAVD 88 (with a factor of safety of 1.2) for 19 hours of the day; therefore, the design is appropriate.

J2.4 Recommendations

The Building 231 RU will be backfilled to the final grades depicted on Figure J-1, and to minimize the surface expression of groundwater. Drainage will be provided through the installation of a drain inlet and a storm drain pipe that discharges groundwater that may rise above the final grade (in late winter and early spring based on historic groundwater elevation data) and storm water to an existing 72-inch storm drain that traverses through the Building 231 RU. However, prior to discharging groundwater to the storm drain, MACTEC will collect 1 groundwater sample (and 1 duplicate sample) from the excavation and test the sample for the RU-specific COCs. If COC concentrations are above the surface water criteria established for the Site, then the RU will be backfilled to historic high groundwater elevations in the area.

TABLES

TABLE J-1
Buildings and Anticipated Sewage Flow Rates in 207/231 Area

Building Number	**Square Footage (ft2)**[1]	**Occupied Status**	**Current Employee Count**[2]	**Current Sewage Flowrate (gpd)**[3]	**Anticipated Flow Rate (gpd)**[4]
Sewage from the South					
222	4,700	Occupied	15	300	940
223	4,800	Not Available	Not Available		960
224	400	Not Available	Not Available		80
225	900	Not Available	Not Available		180
227	3,600	Occupied	Not Available		720
228	12,076	High Voltage Dept	Not Available		2415.2
229	2,758	Vacant	Not Applicable		551.6
230	9,784	Occupied	4	80	1956.8
Sewage from the East					
1029	23,000	Occupied	1 Tenant (Employee?)		4600
1030	23,000	Occupied	1 Tenant (Employee?)		4600
1063	12,789	Vacant	Not Applicable		2557.8
1062	12,869	Occupied	1 Tenant (0 Employee)		2573.8
1076	390	Vacant	Not Applicable		78
1060	13,973	Not Available	Not Available		2794.6
1061	100	Not Available	Not Available		20
1059	3,403	Not Available	Not Available		680.6
1056	625	Not Available	Not Available		125
		Total Sewage Flow Rate (gpd)		380	25,833
		Total Sewage Flow Rate (gpm)		0.3	17.9

Notes:

1) Square footages provided by Signe Anderseel, CBRE, Email dated 8 August 2007 and/or estimated from CAD Drawings.

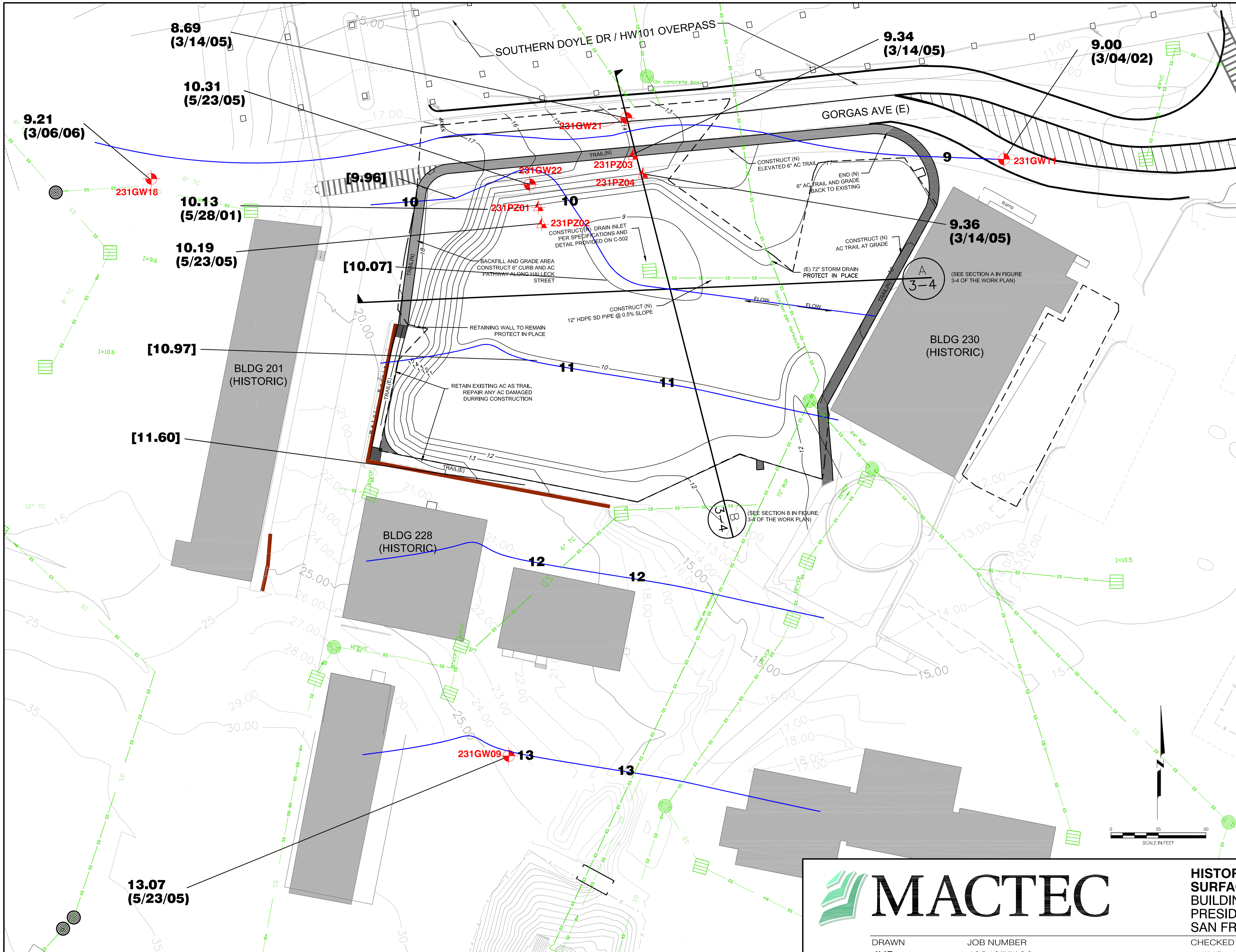
2) Employee counts provided by Signe Anderseel, CBRE, Email dated 8 August 2007.

3) Design Flow = 20 gallons per day/employee (USEPA, 2002 - Collection Systems Technology Fact Sheet, Sewers Convetional Gravity).

4) Design Flow = 0.20 gallons per day/net square feet (USEPA, 2002 - Collection Systems Technology Fact Sheet, Sewers Conventional Gravity).

Checked: RR
Approved: SS

FIGURES



LEGEND:

HISTORIC WALL	
(N) TOPOGRAPHIC CONTOUR	24
(E) TOPOGRAPHIC CONTOUR	24
NEW RAISED AC PATH	
RE-VEGETATION AREA	
MONITORING WELL - SHALLOW SAND	
PIEZOMETER - SHALLOW SAND	
INTERPOLATED SHALLOW ZONE GROUNDWATER ELEV. (PLLW) USED FOR CONTOUR GENERATION ONLY.	[11.67]
HISTORICAL HIGH SHALLOW ZONE GROUNDWATER ELEV. (PLLW) & DATE MONITORED (1)	10.25 (5/23/05)
HIGH GROUNDWATER CONTOUR	9

NOTES

1. HIGHEST REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

2. ALL WATER LEVELS ARE SHOWN IN NAVD 88- US SURVEY FEET, TO BE CONSISTENT WITH TOPOGRAPHIC SURVEY DATA.

MACTEC

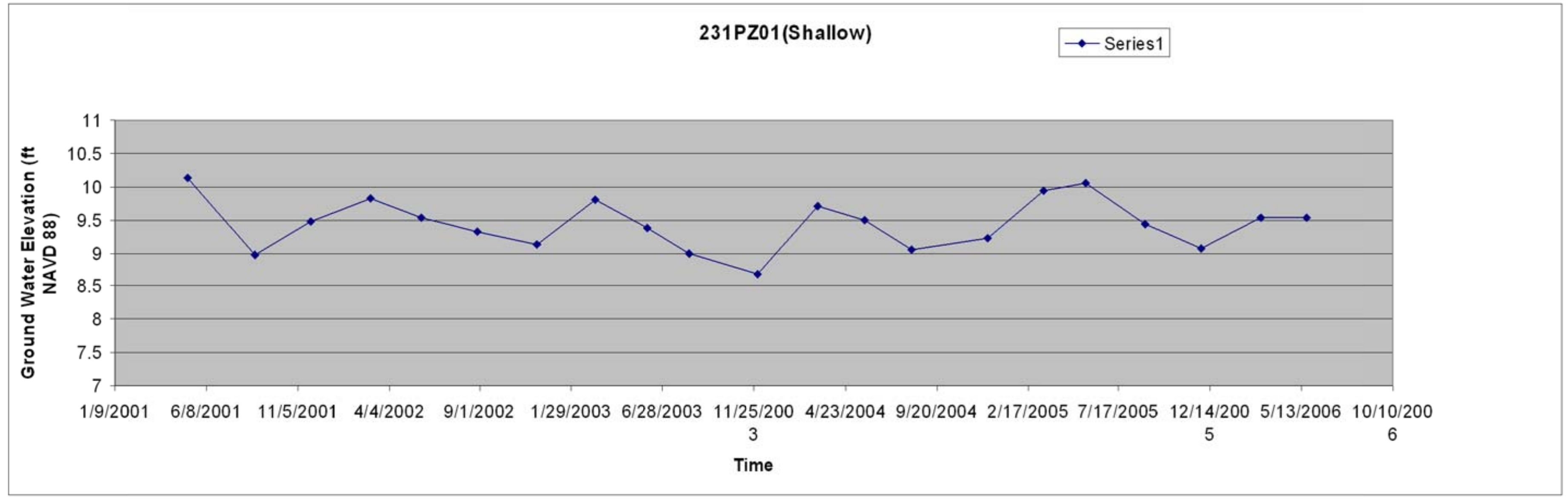
HISTORIC HIGH SHALLOW GROUNDWATER SURFACE AND BUILDING 231 RU RESTORATION PLAN
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
J-1

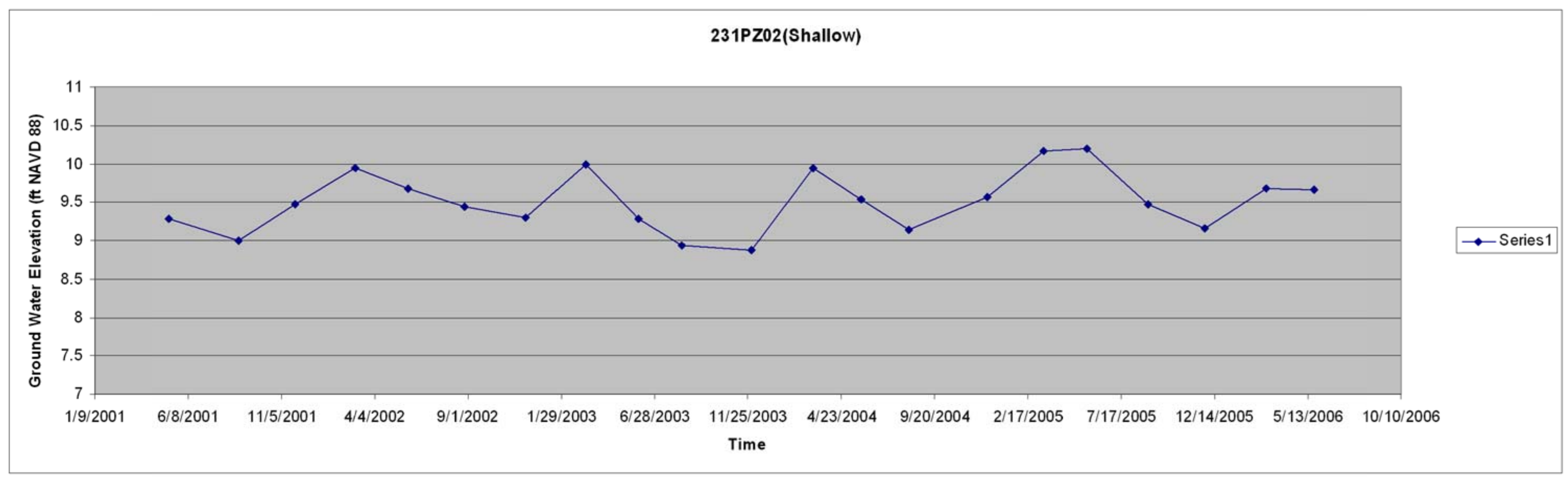
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

4084075106061.DWG 40.0
20071019.1648

231PZ01	
Date	GW Elev. (feet NAVD 88
5/22/2006	9.53
3/6/2006	9.53
11/28/2005	9.07
8/29/2005	9.44
5/23/2005	10.06
3/14/2005	9.93
12/13/2004	9.22
8/9/2004	9.04
5/24/2004	9.49
3/8/2004	9.71
12/1/2003	8.69
8/11/2003	8.99
6/2/2003	9.37
3/10/2003	9.8
12/2/2002	9.12
8/26/2002	9.31
5/28/2002	9.53
3/4/2002	9.82
11/26/2001	9.48
8/27/2001	8.97
5/8/2001	10.13



231PZ02	
Date	GW Elev. (feet NAVD 88
5/22/2006	9.66
3/6/2006	9.67
11/28/2005	9.15
8/29/2005	9.47
5/23/2005	10.19
3/14/2005	10.17
12/13/2004	9.57
8/9/2004	9.14
5/24/2004	9.53
3/8/2004	9.95
12/1/2003	8.87
8/11/2003	8.93
6/2/2003	9.28
3/10/2003	9.99
12/2/2002	9.3
8/26/2002	9.44
5/28/2002	9.67
3/4/2002	9.94
11/26/2001	9.47
8/27/2001	9
5/8/2001	9.29



NOTES

1. REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

2. ALL WATER LEVELS ARE SHOWN IN NAVD 88- US SURVEY FEET, TO BE CONSISTENT WITH TOPOGRAPHIC SURVEY DATA.

MACTEC

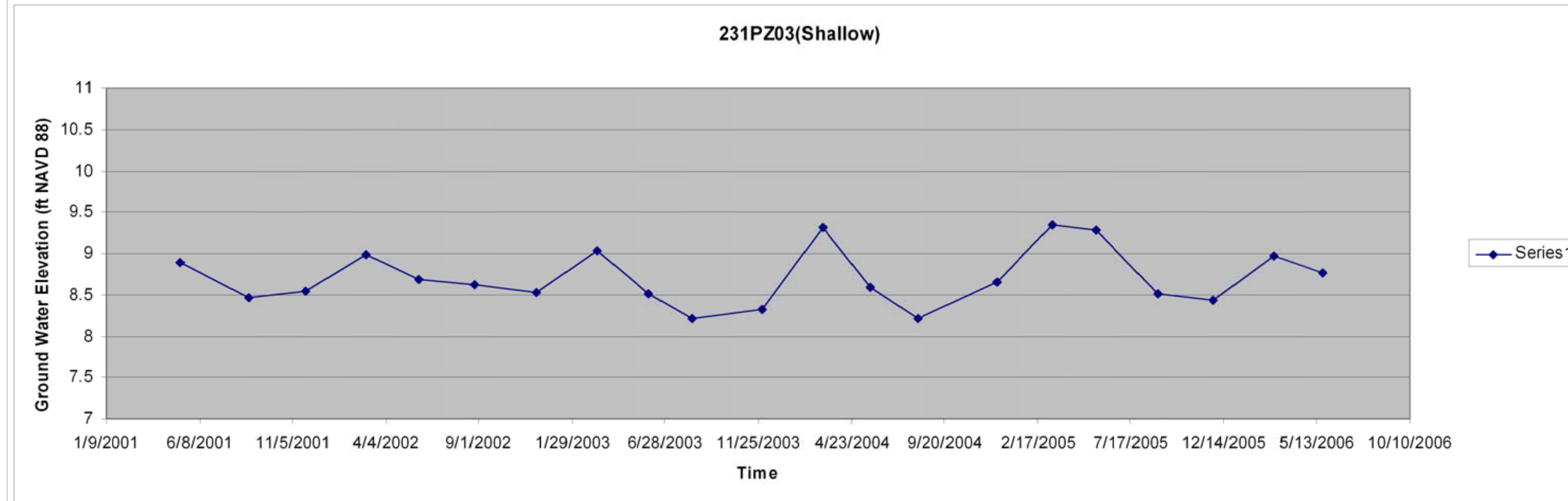
HISTORICAL WATER LEVEL HYDROGRAPHS FOR SHALLOW ZONE AQUIFER WELLS
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE **J-2**

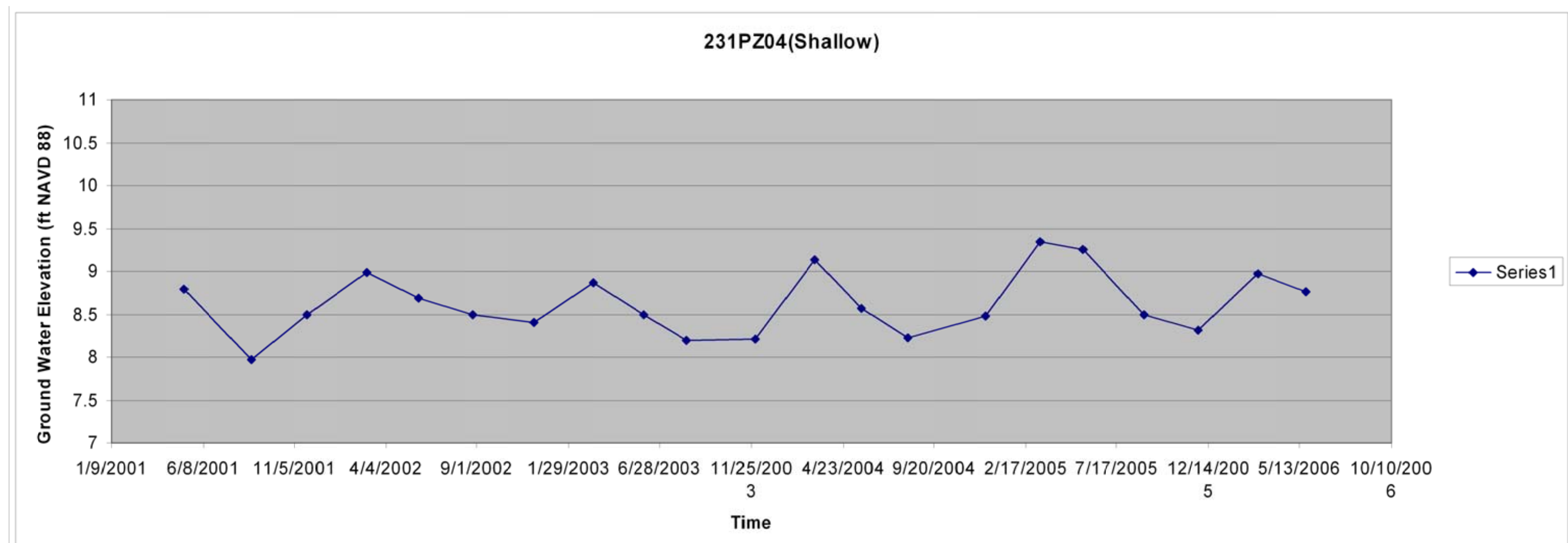
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

4084075106061.DWG 40.0
20071019.1648

231PZ03	
Date	GW Elev. (feet NAVD 88
5/22/2006	8.77
3/6/2006	8.97
11/28/2005	8.43
8/29/2005	8.51
5/23/2005	9.28
3/14/2005	9.34
12/13/2004	8.66
8/9/2004	8.22
5/24/2004	8.59
3/8/2004	9.31
12/1/2003	8.33
8/11/2003	8.22
6/2/2003	8.51
3/10/2003	9.03
12/2/2002	8.52
8/26/2002	8.62
5/28/2002	8.69
3/4/2002	8.99
11/26/2001	8.54
8/27/2001	8.46
5/8/2001	8.89



231PZ04	
Date	GW Elev. (feet NAVD 88
5/22/2006	8.76
3/6/2006	8.97
11/28/2005	8.32
8/29/2005	8.5
5/23/2005	9.26
3/14/2005	9.35
12/13/2004	8.48
8/9/2004	8.22
5/24/2004	8.57
3/8/2004	9.13
12/1/2003	8.21
8/11/2003	8.19
6/2/2003	8.49
3/10/2003	8.87
12/2/2002	8.4
8/26/2002	8.5
5/28/2002	8.69
3/4/2002	8.98
11/26/2001	8.49
8/27/2001	7.97
5/8/2001	8.79



NOTES

1. REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

2. ALL WATER LEVELS ARE SHOWN IN NAVD 88- US SURVEY FEET, TO BE CONSISTENT WITH TOPOGRAPHIC SURVEY DATA.

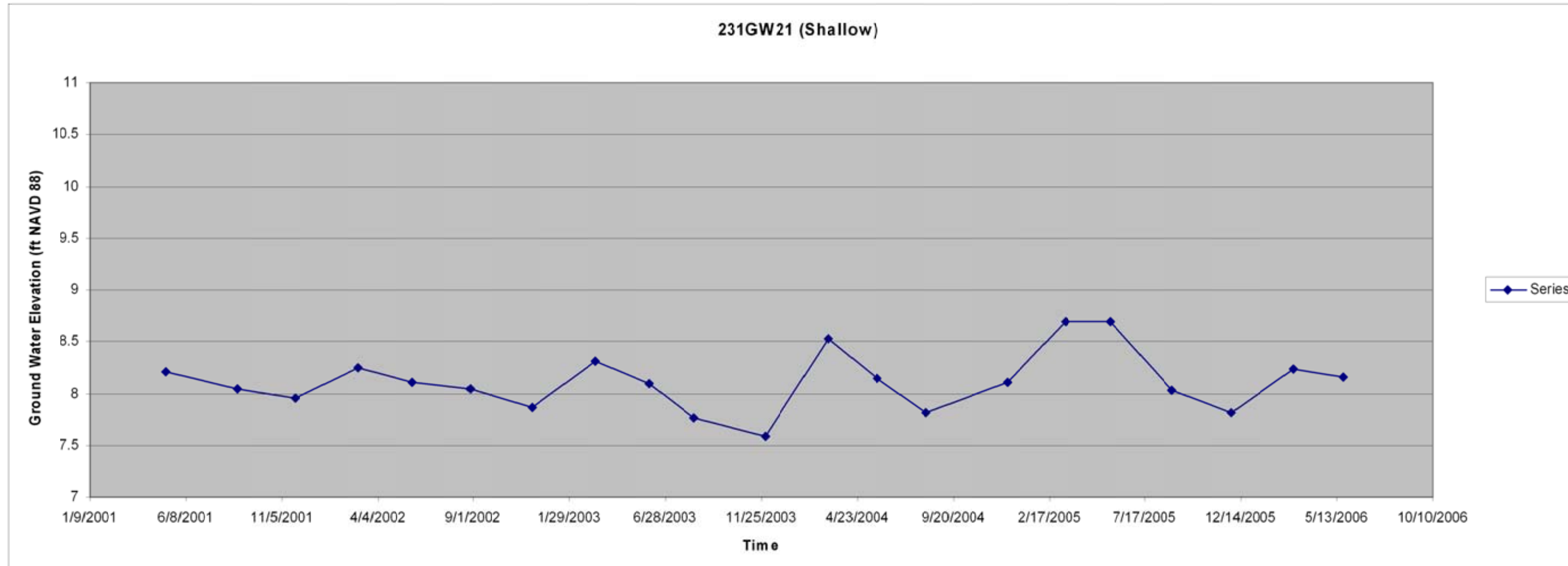
MACTEC

HISTORICAL WATER LEVEL HYDROGRAPHS FOR SHALLOW ZONE AQUIFER WELLS
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

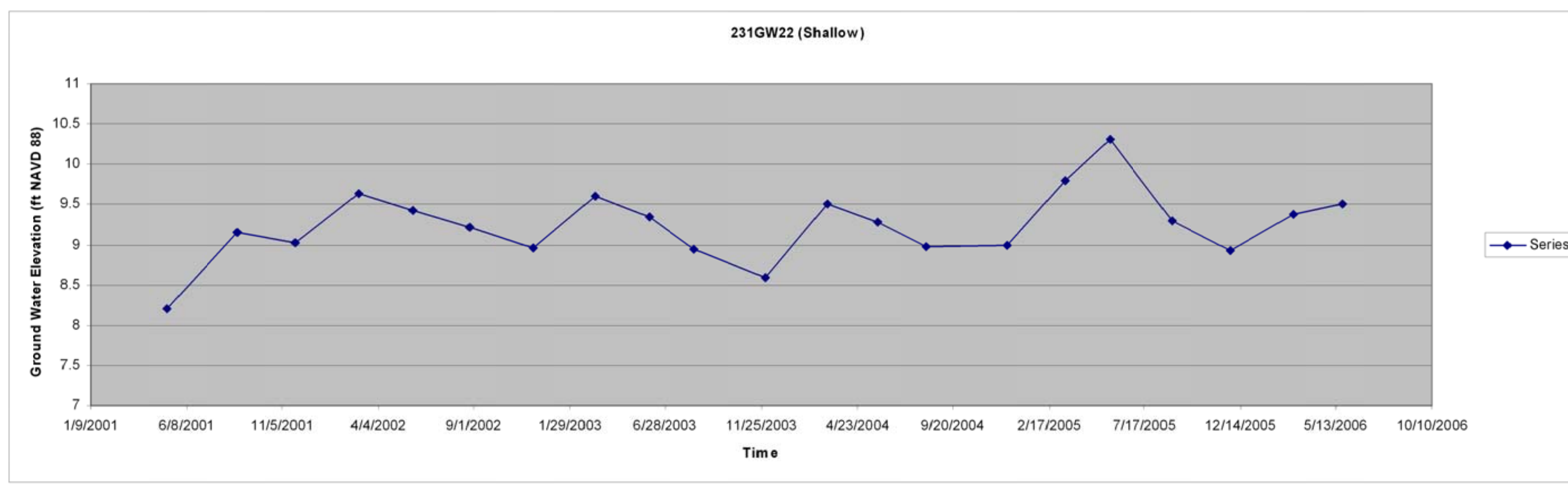
FIGURE **J-3**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

231GW21	
Date	GW Elev. (feet NAVD 88
5/22/2006	8.16
3/6/2006	8.24
11/28/2005	7.82
8/29/2005	8.03
5/23/2005	8.69
3/14/2005	8.69
12/13/2004	8.11
8/9/2004	7.81
5/24/2004	8.15
3/8/2004	8.53
12/1/2003	7.58
8/11/2003	7.77
6/2/2003	8.09
3/10/2003	8.31
12/2/2002	7.86
8/26/2002	8.04
5/28/2002	8.11
3/4/2002	8.25
11/26/2001	7.96
8/27/2001	8.05
5/8/2001	8.21



231GW22	
Date	GW Elev. (feet NAVD 88
5/22/2006	9.51
3/6/2006	9.38
11/28/2005	8.93
8/29/2005	9.29
5/23/2005	10.31
3/14/2005	9.79
12/13/2004	9
8/9/2004	8.97
5/24/2004	9.28
3/8/2004	9.51
12/1/2003	8.59
8/11/2003	8.94
6/2/2003	9.35
3/10/2003	9.6
12/2/2002	8.96
8/26/2002	9.22
5/28/2002	9.42
3/4/2002	9.63
11/26/2001	9.02
8/27/2001	9.15
5/8/2001	8.21



NOTES

1. REPORTED GROUNDWATER ELEVATION DATA FROM 2001 THROUGH 2006 FOUND IN THE PRESIDIO SEMI ANNUAL GROUNDWATER MONITORING REPORT 1ST AND 2ND QUARTERS 2006 (TREADWELL AND ROLLO, OCTOBER 2006)

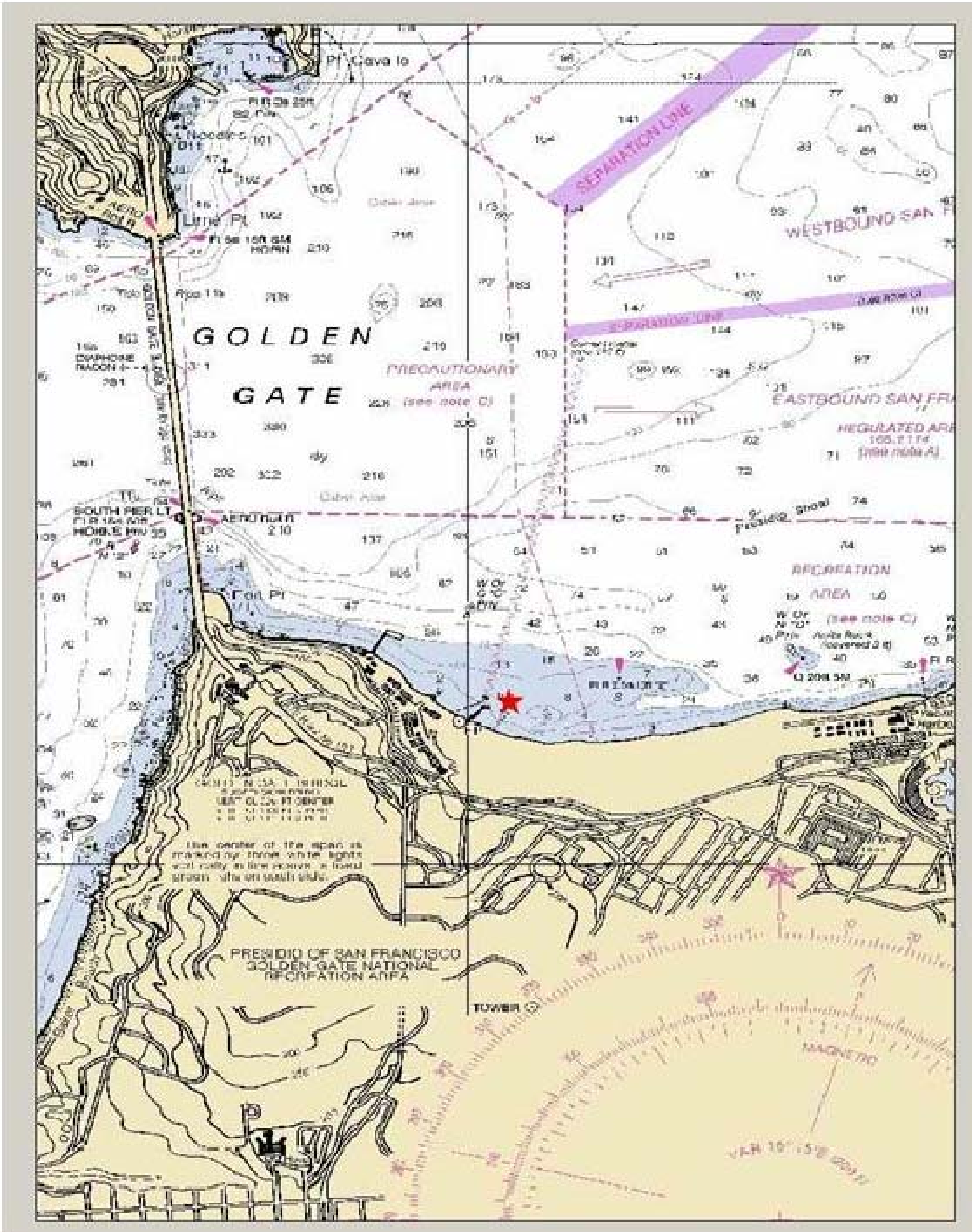
2. ALL WATER LEVELS ARE SHOWN IN NAVD 88- US SURVEY FEET, TO BE CONSISTENT WITH TOPOGRAPHIC SURVEY DATA.

MACTEC

HISTORICAL WATER LEVEL HYDROGRAPHS FOR SHALLOW ZONE AQUIFER WELLS
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
J-4

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007



LEGEND

★ TIDE STATION 9414290

NOTES:

1. TIDE DATA SOURCE; GGNRA TIDE GAGE
   (LOCATED UNDER MARSH FOOT BRIDGE)
   NATIONAL OCEANIC AND ATMOSPHERIC
   ADMINISTRATION WEB SITE STATION #9414290.

N

NOT TO SCALE

MACTEC

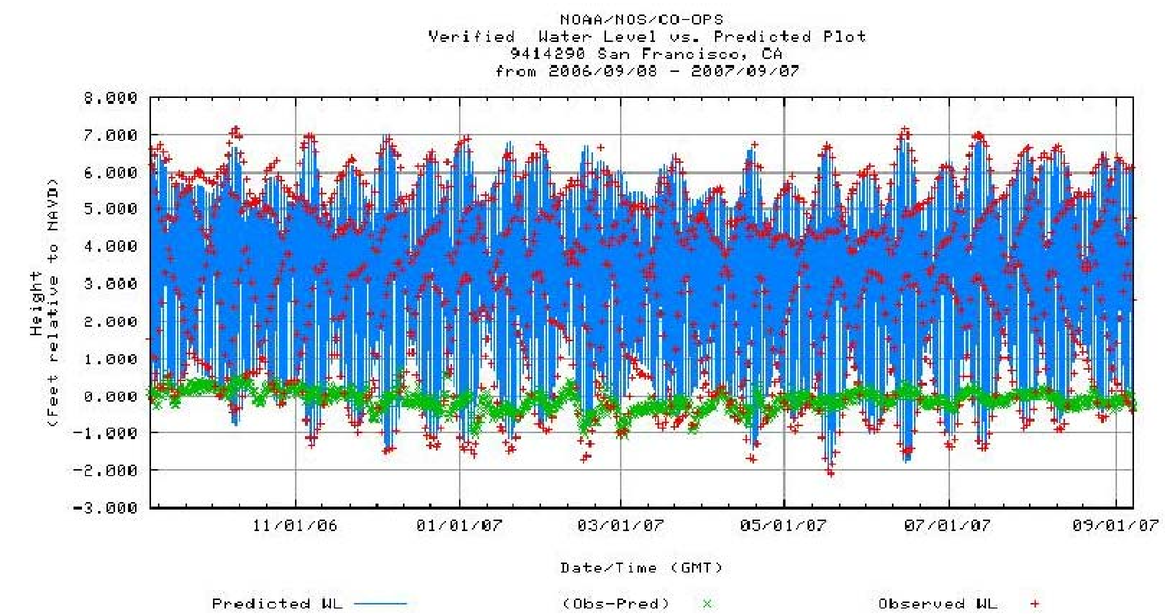
TIDE STATION LOCATION MAP
FOR SAN FRANCISCO BAY
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

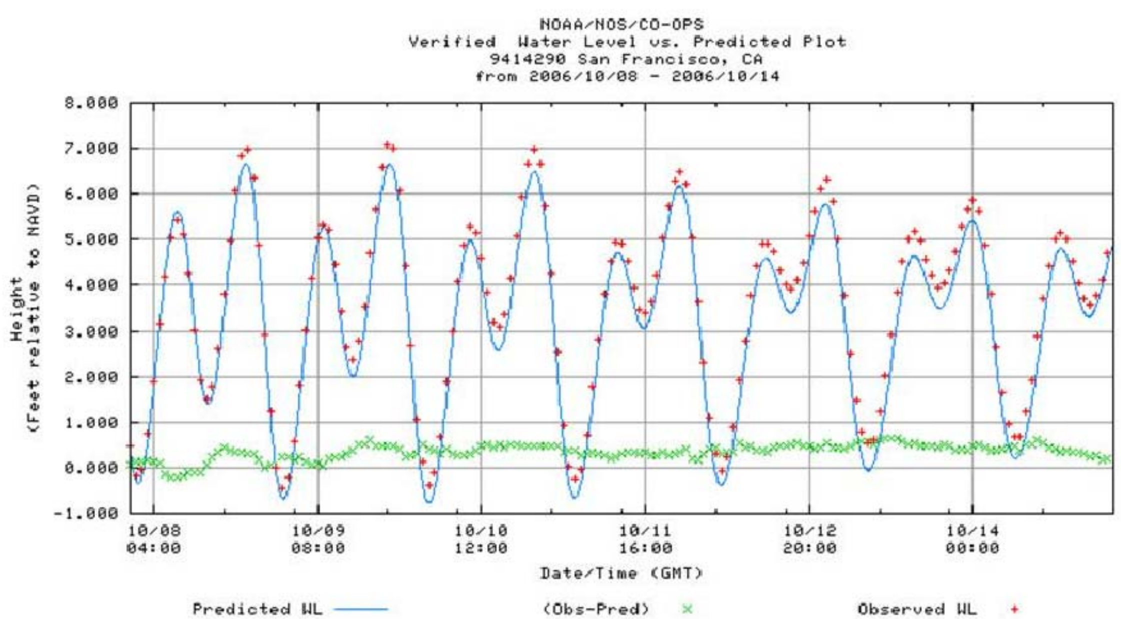
FIGURE **J-5**

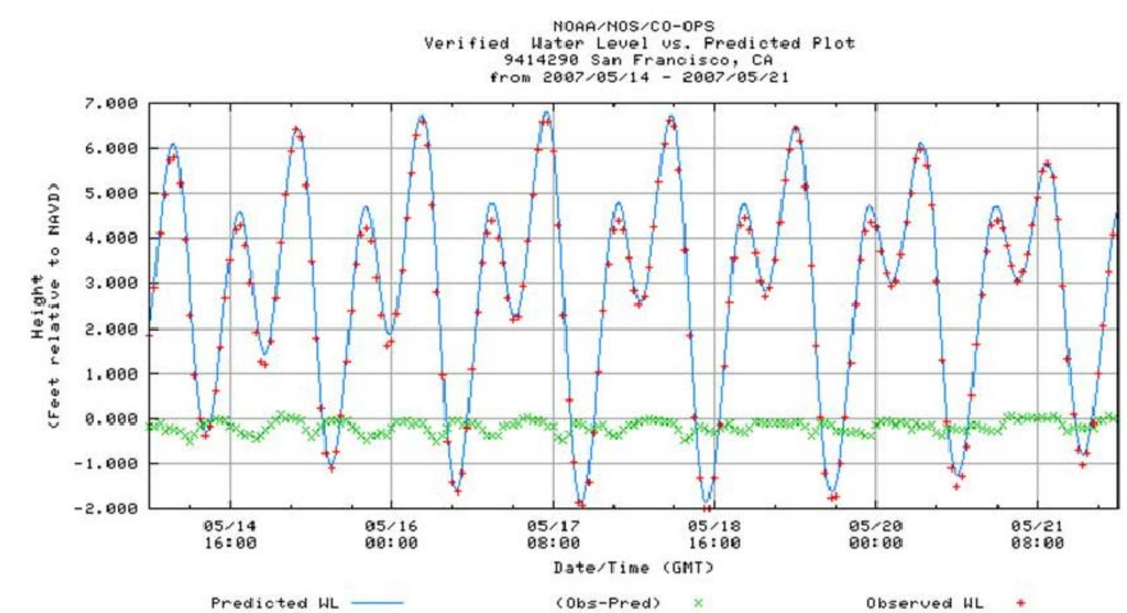
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

NOTES:

1. HIGH AND LOW TIDE ELEVATION DATA FROM 2006-2007, FOUND: "WATER SURFACE ELEVATION TIME SERIES, CRISSY FIELD WETLAND, 2006-2007". SOURCE; GGNRA TIDE GAGE (LOCATED UNDER MARSH FOOT BRIDGE) NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION WEB SITE STATION #9414290.







MACTEC

TIDE LEVELS IN THE SANFRANCISCO BAY
STATION 9414290
BUILDING 207/231 AREA
PRESIDIO OF SAN FRANCISCO
SAN FRANCISCO, CALIFORNIA

FIGURE
J-6

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
JHD	4084075106	JHD	11/2007	RR	11/2007

ATTACHMENT 1

SEWAGE EJECTOR PUMP TECHNICAL SPECIFICATIONS

REVIEWED: RR

HYDROMATIC®

SKV40

Submersible Sewage Ejector Pump

Available

- Manual Operation
- Automatic Operation
- Wide Angle (shown)

HYDROMATIC SUPPORTS THE PROFESSIONAL

HYDROMATIC®
Pentair Pump Group

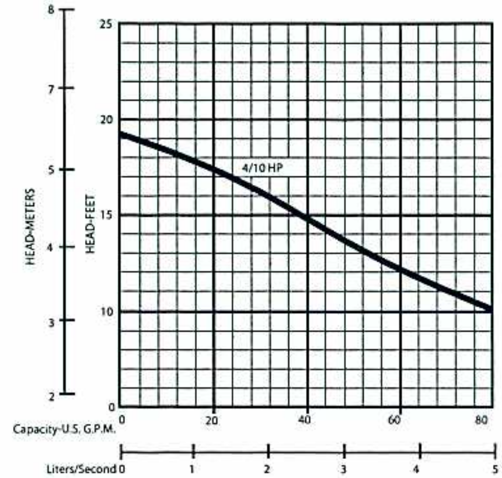
SKV40 - Submersible Sewage Ejector Pump

Details

Pump Characteristics

Pump/Motor Unit	Submersible	
Manual Models	SKV40M1	SKV40M2
Automatic Models	SKV40A1	SKV40A2
Horsepower	4/10	
Full Load Amps	12.6	6.4
Motor Type	Shaded Pole (4 Pole)	
R.P.M.	1550	
Phase Ø	1	
Voltage	115	230
Hertz	60	
Operation	Intermittent	
Temperature	120°F Ambient	
NEMA Design	A	
Insulation	Class A	
Discharge Size	2" NPT std.	
Solids Handling	2"	
Unit Weight	35 lbs.	
Power Cord	18/3, SJTW, 10' std. (20' opt.) 230V = 10' std.	

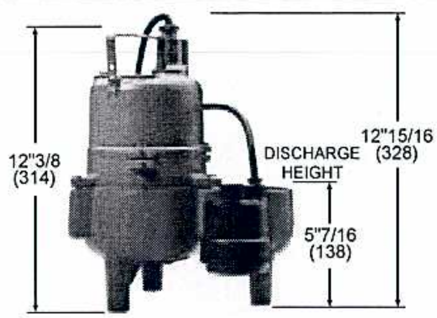
Performance Data



Materials of Construction

Handle	Steel
Lubricating Oil	Dielectric Oil
Motor Housing	Cast Iron
Seal Plate	Cast Iron
Pump Casing	Cast Iron
Shaft	Stainless Steel
Mechanical Shaft Seal	Seal Faces: Carbon/Ceramic Seal Body: Anodized Steel Spring: Stainless Steel Bellows: Buna-N
Impeller	Engineered Thermoplastic
Upper Bearing	Brass Sleeve Bearing
Lower Bearing	Single Row Ball Bearing
Fasteners	Stainless Steel

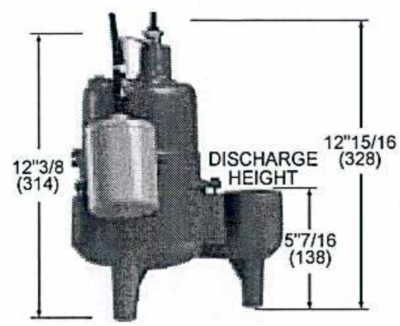
Dimensional Data

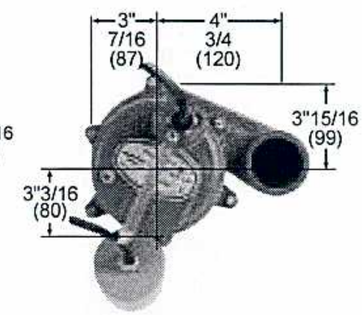


Diaphragm Switch
On = 8-7/8
Off = 4-1/4

Vertical Switch
On = 8-15/16
Off = 4-7/16

Wide Angle Switch
On = 12-1/2
Off = 6-1/2





All dimensions in inches. Metric for international use. Component dimensions may vary ± 1/8 inch. Dimensional data not for construction purpose unless certified. Dimensions and weights are approximate. On/Off level adjustable. We reserve the right to make revisions to our product and their specifications without notice.

HYDROMATIC®
Pentair Pump Group

– Your Authorized Local Distributor –

USA
1840 Baney Road Ashland, Ohio 44805
Tel: 419-289-3042 Fax: 419-281-4087

www.hydromatic.com

CANADA
269 Trillium Drive Kitchener, Ontario, Canada N2G 4W5
Tel: 519-896-2163 Fax: 519-896-6337

ATTACHMENT 2

COSTS DIFFERENTIAL TO RAISE GRADE TO HISTORIC HIGH GROUNDWATER ELEVATIONS

REVIEWED: RR

MACTEC

MACTEC Engineering and Consulting, Inc.
5341 Old Redwood Highway, Suite 300
Petaluma, CA 94954

JOB NO. 4084075106 SHEET 1 OF 1
PHASE TASK 02
JOB NAME 207/231 RESTORATION
BY Jutanzol - Durbin DATE 10/12/07
CHECKED BY Ram Rao DATE 10/12/07

Costs Differential ~~between~~ to raise to historic high elevations:

The difference in options is a 1ft elevation change to the 27,900 ft^2 low area of the site.

$27,900\ ft^2 \cdot 1ft = 27,900\ ft^3$

$= 1033\ yd^3$

@ $1.21\ ton/yd^3$

: 1250 tons

@ \$35/ton

Cost = \$43761.00

or

≈\$44,000

ATTACHMENT 3

PRECIPITATION FREQUENCY DATA OUTPUT, BLDG 207/231 AREA

REVIEWED: RR

Precipitation Frequency Data Output, Bldg 207/231 Area
NOAA Atlas 2
California 37.8 N 122.45 W
Site-specific Estimates

Map	Precipitation (inches)	Precipitation Intensity (in/hr)
2-year 6-hour	1.32	0.22
2-year 24-hour	2.32	0.10
100-year 6-hour	2.47	0.41
100-year 24-hour	4.94	0.21

Hydrometeorological Design Studies Center - NOAA/National Weather Service
1325 East-West Highway - Silver Spring, MD 20910 - (301) 713-1669

Wed Oct 3 14:50:49 2007

ATTACHMENT 4

CALCULATIONS FOR STORM WATER DRAINAGE FOR BLDG 207/231 AREA

REVIEWED: RR

MACTEC

MACTEC Engineering and Consulting, Inc.
5341 Old Redwood Highway, Suite 300
Petaluma, CA 94954

JOB NO. 408 4075106 SHEET 1 OF 2
PHASE TASK 02
JOB NAME 207/234 Restoration
BY J. Hamel-Dubin DATE 10/12/07
CHECKED BY Ram Rao DATE 10/12/07

Water drainage from Restoration Area:

Objective: ① Determine Rainfall in Restoration area that will accumulate during 5hr high tide.
② Determine if 12" HDPE SD pipe @ a .5% slope will be adequate.
③ Check worst case senerio time to drain the site durring a high groundwater event & large storm.

note: Restoration Low Area = 27,900 ft^2

① From NOAA website 100yr 6hr storm intensity = .41 in/hr
Assume: -Soil is 100% saturated with GW so runoff coefficient = 1.00
-High tide will last 5hr

$$V_{quantity\ of\ water} = (.41\,in/hr)\left(\frac{ft}{12in}\right)(27{,}900\,ft^2)(5hr)$$

$$\underline{V = 4766\,ft^3}$$

This is amount of water that will accumulate durring the 5hr high tide when there is a large storm (100yr, 6hr)

Note: 5hr tide was found from real time data & is maximum time the tide is above 5ft. Storm Drain connects to 72" SD approximately just above 5ft and should be able to begin draining site once tide falls below 5ft

② 12" HDPE SD pipe @0.5% slope

$$V = \frac{1.486}{n}(R^{2/3})(S^{1/2})$$

Assume: n = mannings roughness coef. = 0.009 for PVC
S = Slope = .005
R = hydraulic Radius = A/per = 12/24 = .25

$$V = \frac{1.486}{.009}(.25^{2/3})(.005^{1/2})$$

$$= \underline{4.63\,ft/s} > 2.5\,ft/s$$ (PE textbook suggest to be above 2.5 ft/s)

Good

Reference: Formulas & constants were found in "Civil Engineering Reference Manual for PE Exam", 10th edition. Michael R. Lindeburg P.E.

MACTEC

MACTEC Engineering and Consulting, Inc.
5341 Old Redwood Highway, Suite 300
Petaluma, CA 94954

JOB NO. 4084075106 SHEET 2 OF 2
PHASE TASK 02
JOB NAME 207/231 RESTORATION
BY J. Hazel-Dubin DATE 10/12/07
CHECKED BY Ram Rao DATE 10/12/07

(3) Worst Case Scenario where 5hr high tide occurs during 100 yr - 6hr storm at a time where GW levels are at a peak 1ft above ground surface.

Question: how long will it take to drain.

- Determine Flow (Q) through SD pipe

$Q = AV$
$= (.785)(4.63)$
$= 3.63 \, ft^3/s$

$A = \pi r^2$
$= \pi (6/12)^2$
$= .785$

$Q = 3.63 \, ft^3/s$ = Flow of water leaving site once tide drops

- Determine Flow coming onto the site during storm

$Q = .41 \, in/hr \, (ft/12in)(27,700 ft^2) = 953.25 \, ft^3/hr \left(\frac{hr}{60 min}\right)\left(\frac{min}{60 sec}\right)$
$= .265 \, ft^3/sec$

- Flow leaving site

$Q_{in} = .265 \, ft^3/sec$
$Q_{out} = 3.63 \, ft^3/sec$

$Flow_{out} = Q_{out} - Q_{in} = 3.36 \, ft^3/sec$

- Time to remove water from site:

$T = Vol_{collected} / Flow_{out}$

$V_{collected} = V_{quantity\ of\ rainfall\ collected} + V_{Ground\ water}$

$V_{ground\ water} = 27,900 ft^2 \cdot 1 ft = 27,900 \, ft^3$

$V_{quantity\ of\ rainfall\ collected}$ (from (1)) $= 4766 \, ft^3$

$T = \frac{27,900 + 4766}{3.36} = 9722 \, sec = 2.7 \text{ hours}$

good #

ATTACHMENT 5

BACKUP ASSUMPTIONS FOR HYDRAULIC CAPACITY ESTIMATION
OF NEW 12-INCH STORM DRAIN LINE

REVIEWED: RR

CIVIL ENGINEERING REFERENCE MANUAL,
MICHAEL LINDBURG

APPENDIX 18.B (continued)
Properties of Saturated Steam by Temperature

		specific volume (ft³/lbm)		internal energy (Btu/lbm)		enthalpy (Btu/lbm)			entropy (Btu/lbm-°R)	
temp. (°F)	absolute pressure	sat. liquid (v_f)	sat. vapor (v_g)	sat. liquid (u_f)	sat. vapor (u_g)	sat. liquid (h_f)	evap. (h_{fg})	sat. vapor (h_g)	sat. liquid (s_f)	sat. vapor (s_g)
300	67.01	0.01745	6.466	269.5	1099.8	269.7	910.3	1180.0	0.4372	1.6351
310	77.69	0.01755	5.626	279.8	1101.9	280.1	902.8	1182.8	0.4507	1.6230
320	89.67	0.01765	4.914	290.1	1103.9	290.4	895.1	1185.5	0.4640	1.6120
330	103.07	0.01776	4.308	300.5	1105.9	300.8	887.2	1188.0	0.4772	1.6017
340	118.02	0.01787	3.788	310.9	1107.7	311.2	879.3	1190.5	0.4903	1.5907
350	134.63	0.01799	3.342	321.3	1109.4	321.7	871.0	1192.7	0.5032	1.5789
360	153.03	0.01811	2.958	331.8	1111.0	332.2	862.5	1194.8	0.5161	1.5681
370	173.36	0.01823	2.625	342.3	1112.5	342.9	853.8	1196.7	0.5289	1.5580
380	195.71	0.01836	2.336	352.9	1113.9	353.5	845.0	1198.5	0.5415	1.5478
390	220.3	0.01850	2.084	363.5	1115.1	364.3	835.8	1200.1	0.5541	1.5378
400	247.3	0.01864	1.864	374.2	1116.2	375.1	826.4	1201.4	0.5667	1.5279
410	276.7	0.01878	1.671	385.0	1117.1	385.9	816.7	1202.6	0.5791	1.5182
420	308.8	0.01894	1.501	395.8	1117.8	396.9	806.8	1203.6	0.5915	1.5084
430	343.6	0.01910	1.351	406.7	1118.4	407.9	796.4	1204.3	0.6038	1.4990
440	381.5	0.01926	1.218	417.6	1118.9	419.0	785.8	1204.8	0.6161	1.4895
450	422.5	0.01944	1.0999	428.7	1119.1	430.2	774.9	1205.1	0.6283	1.4802
460	466.8	0.01962	0.9951	439.8	1119.2	441.5	763.6	1205.1	0.6405	1.4708
470	514.5	0.01981	0.9015	451.1	1119.0	452.9	752.0	1204.9	0.6527	1.4615
480	566.0	0.02001	0.8179	462.4	1118.7	464.5	739.8	1204.3	0.6648	1.4522
490	621.2	0.02022	0.7429	473.8	1118.1	476.1	727.4	1203.5	0.6769	1.4428
500	680.6	0.02044	0.6756	485.1	1117.2	487.9	714.4	1202.3	0.6891	1.4335
520	812.1	0.02092	0.5601	508.9	1114.6	512.0	686.9	1198.9	0.7134	1.4146
540	962.2	0.02146	0.4655	533.0	1111.1	536.8	657.2	1194.0	0.7378	1.3952
560	1132.7	0.02209	0.3874	557.8	1106.0	562.4	624.8	1187.2	0.7625	1.3753
580	1325.3	0.02279	0.3223	583.5	1099.2	589.1	589.2	1178.3	0.7876	1.3543
600	1542.5	0.02363	0.2674	610.3	1090.3	617.0	549.6	1166.6	0.8133	1.3320
620	1786.2	0.02465	0.2206	638.6	1078.6	646.7	504.8	1151.5	0.8398	1.3077
640	2059.2	0.02593	0.1802	668.9	1063.2	678.7	453.1	1131.8	0.8681	1.2803
660	2365	0.02766	0.1444	702.1	1042.2	714.5	393.5	1108.0	0.8991	1.2482
680	2707	0.03038	0.1113	742.2	1011.1	757.4	309.4	1066.8	0.9355	1.2070
700	3093	0.03665	0.0748	801.5	948.2	822.5	168.5	991.0	0.9900	1.1350
705.1028	3200.11	0.049746	0.049746	866.6	866.6	906.1	0	906.1	1.0530	1.0530
32.018	0.08871	0.01602	3300	0.0	1021.0	0.000253	1075	1075.2	0	2.1863

APPENDIX 19.A
Manning's Roughness Coefficients[a,b]
(design use)

channel material	n
plastic (PVC and ABS)	0.009 ← PE/PVC Pipe.
clean, uncoated cast iron	0.013-0.015
clean, coated cast iron	0.012-0.014
dirty, tuberculated cast iron	0.015-0.035
riveted steel	0.015-0.017
lock-bar and welded steel pipe	0.012-0.013
galvanized iron	0.015-0.017
brass and glass	0.009-0.013
wood stave	
small diameter	0.011-0.012
large diameter	0.012-0.013
concrete	
average value used	0.013
typical commercial, ball and spigot rubber gasketed end connections	
full (pressurized and wet)	0.010
– partially full	0.0085
with rough joints	0.016-0.017
dry mix, rough forms	0.015-0.016
wet mix, steel forms	0.012-0.014
very smooth, finished	0.011-0.012
vitrified sewer	0.013-0.015
common-clay drainage tile	0.012-0.014
asbestos	0.011
planed timber (flume)	0.012 (0.010-0.014)
canvas	0.012
unplaned timber (flume)	0.013 (0.011-0.015)
brick	0.016
rubble masonry	0.017
smooth earth	0.018
firm gravel	0.023
corrugated metal pipe (CMP)	0.024 (see App. 17.F)
natural channels, good condition	0.025
rip rap	0.035
natural channels with stones and weeds	0.035
very poor natural channels	0.060

[a] Compiled from various sources.
[b] Values outside these ranges have been observed, but these values are typical.

APPENDIX K

RESPONSES TO NATIONAL PARK SERVICE COMMENTS

Responses to National Park Service Comments on the Draft Corrective Action Implementation Work Plan, Building 207/231 Area, dated February 15, 2007

MACTEC Engineering and Consulting, Inc. (MATCEC) has prepared these responses to National Park Service (NPS) comments dated March 5, 2007 on the *Draft Corrective Action Implementation Work Plan for the Building 207/231 Area, Presidio of San Francisco, California* (Draft Work Plan). This Revised Draft Work Plan has been edited and reorganized to address NPS comments and facilitate regulatory review. Also accompanying this Revised Draft Work Plan are Construction Documents that include the Construction Drawings and Technical Specifications that provide the design and the approach to be followed by the Excavation Contractor for implementation of excavation corrective actions at the Site.

Comment 1: **Section 2.2.3 Groundwater Monitoring, page 2-4:**
The discussion in this section, regarding the analytical parameters that will be monitored to evaluate the effectiveness of the ORC Advanced™, does not include all of the parameters that were recommended by Regenesis for this project. The Regenesis recommendations are presented in their December 4, 2006, letter included in Appendix E. This discussion should be expanded to discuss why the Regenesis recommendations are not being followed, or revised to include the additional recommended parameters. A comment similar to this was previously made as Comment #22 in the December 26, 2006 NPS comments on the *Draft Corrective Action Implementation Work Plan, Technical Specifications, and Drawings, Building 1065 Area*, dated November 22, 2006.

Response 1**:** Section 3.1.7.1 of the Revised Draft Work Plan has been revised to indicate for the new well to be installed downgradient of the Building 228 RU where ORC Advanced™ injection is planned, the collected groundwater will be tested for the analytes and the field parameters, except biochemical oxygen demand (BOD-5 day) and chemical oxygen demand (COD) recommended by Regenesis in their 4 December 2006 letter. BOD-5 day and COD is not recommended as the significant demand for the ORC™ will be from natural organic matter on the soil matrix rather than from the dissolved phase oxygen. Therefore, analysis of BOD-5 day and COD will not yield significant benefit in the evaluation of ORC demand.

Comment 2: **Section 2.2.3 Groundwater Monitoring, page 2-5:**
This discussion indicates a number of groundwater indicator parameters that will be monitored to identify if aerobic biodegradation is taking place. Since it is not clear how the listed parameters would be used to make this identification, the work plan should include a brief description of how this analysis will be performed.

Response 2**:** Section 3.1.7.1 of the Revised Draft Work Plan has been revised to describe how data regarding the listed parameters will be used to monitor for conditions indicative of aerobic biodegradation.

Comment 3: **Section 2.2.3 Groundwater Monitoring, page 2-7:**
This description indicates that monitoring cessation will occur on a well by well basis as COC levels are shown to be below cleanup levels. Since the upgradient well may be expected to be free from site COCs from the beginning, special

consideration to continue the monitoring of this well should be described, such that sampling of this well continues as long as it is needed for comparison to monitored down-gradient wells.

Response 3: Section 2.1.7 of the Revised Draft Work Plan (Pre- and Post- Construction Groundwater Monitoring) has been revised to indicate that monitoring well.231 GW-09, located upgradient of the RUs, will continue to be monitored until the COC concentrations in all the monitoring wells included in the post construction groundwater monitoring for the Site are below cleanup levels.

Comment 4: Section 2.2.4 Land Use Controls, page 2-7:
The remedy implementation described in this work plan includes a number of LUC considerations and choices that the Trust proposes to make during the construction. The contractor for development of the LUCs and site specific LUCMRR addendum should be identified in this work plan, prior to the start of the construction, so that they may participate in these LUC considerations.

Response 4: Sections 1.4 (Corrective Action Contracting) and 2.1.8 (Land Use Controls) of the Revised Draft Work Plan have been revised to clarify MACTEC will be the contractor who will document the LUCs and prepare the LUCMRR addendum.

Comment 5: Section 2.2.4 Land Use Controls, page 2-8:
This discussion of LUCs should be revised to address the specific to the plans for LUCs at this site.

Response 5: Section 2.1.8 of the Revised Draft Work Plan has been revised to clarify the RU- and media-specific LUCs for the Site.

Comment 6: Section 3.1 Project Team Points of Contact, page 3-3:
This section identifies five activities for which contractors are yet to be determined. As described in Section 1.0, technical specifications will be prepared for the excavation activity and provided for review; however, the details and specifications regarding the other identified activities should also be provided for review.

Response 6: Section 1.4 of the Revised Draft Work Plan (Corrective Action Contracting) has been updated to identify the four corrective action contractors that will perform the field work required to implement the corrective actions, and Sections 4.0 (Construction Documentation) and 5.0 (Reporting and Corrective Action Implementation Documentation) summarize the details, specifications, and reporting requirements for each of the corrective action components that will be provided for review.

Comment 7: Section 4.1 Sequence of Project Activities, page 4-2:
This section indicates that the sequencing of tasks will be in accordance with criteria that are presented in the Construction Documents. These documents are not yet available for review. This work plan presentation of project sequencing should be revised to include discussion of the proposed sequence of tasks.

Response 7: The Construction Documents accompany the Revised Draft Work Plan, and Sections 3.1, 3.2, and 3.3 of the Revised Draft Work Plan presents a discussion of the proposed sequencing of pre-construction, construction, and post-construction tasks, respectively.

Comment 8: Section 4.1.1 Pre-Construction Tasks, page 4-2:
The demolition of Building 231 appears to be a "Pre-Construction" task; however, discussion of this task is not included in this description of pre-construction tasks. Discussion of the building demolition should be provided and include a presentation of the scope of demolition that will be accomplished prior to the start of excavation.

Response 8: Section 1.4 of the Revised Draft Work Plan (Corrective Action Contracting) has been updated to indicate that the demolition of Building 231 will be completed prior to initiation of the corrective actions; therefore, the details of the demolition scope and specifications will be provided by the Trust for review under separate cover.

Comment 9: Section 4.1.1 Pre-Construction Tasks, Notifications, page 4-3:
This section indicates that the Trust will "notify the appropriate regulatory agencies" but does not identify which agencies these are. The agencies that the Trust will notify regarding this proposed work should be specifically identified.

Response 9: Section 3.1.4 (Notifications, Permits, and Approvals) of the Revised Draft Work Plan has been revised to identify the agencies to be notified of pre-construction activities.

Comment 10: Section 4.1.1 Pre-Construction Tasks, Notifications, page 4-3:
This section indicates that the Trust will notify all "Resource Groups" and onsite tenants of existing buildings a minimum of two weeks prior to the initiation of implementation. This amount of time may not be adequate for some of the potentially impacted programs and consideration should be given to increasing this notice period. In addition, the specific groups that will be notified should be identified.

Response 10: Section 3.1.4 (Notifications, Permits, and Approvals) of the Revised Draft Work Plan has been revised to identify the list of stakeholders that will be notified, and notification timeframes. MACTEC and the Trust have initiated contact with the various resource groups that have an interest in the project. This process will continue until mobilization phase, which is scheduled for Spring 2008. In addition, the Trust will also notify the stakeholders of the start date approximately a month before project kick-off.

Comment 11: Section 4.1.1 Pre-Construction Tasks, Caltrans Permit for Excavation Areas Adjacent to Doyle Drive Overpass Structure (Building 207 and 38 RUs), page 4-4:
This section describes that an encroachment permit from Caltrans may be needed and that such a determination would be made during the "design process." Since the design process will be complete with the submittal of the work plan and construction documents, this description of the need for an encroachment permit should be revised to describe when this determination will be made.

Response 11: Section 3.1.4 (Notifications, Permits, and Approvals) of the Revised Draft Work Plan has been revised to indicate that CalTrans will be notified at least two weeks prior to the start of demolition and excavation activities; however, because the excavations will not encroach into the CalTrans right of way, no Cal Trans encroachment permit is required for this project.

Comment 12: Section 4.1.1 Pre-Construction Tasks, Pre-Construction Groundwater Monitoring, page 4-4:
The specifics regarding the proposed timing of the pre-construction monitoring should be provided.

Response 12: Section 3.1.2 of the Revised Draft Work Plan (Pre-Construction Groundwater Monitoring) has been revised to clarify the specifics regarding the proposed timing. T&R will perform the pre-construction groundwater monitoring approximately one and three months prior to initiation of ORC Advanced™ injection and excavation activities, respectively.

Comment 13: Section 4.1.1 Pre-Construction Tasks, Monitoring Well Abandonment, page 4-4:
This section notes that existing wells or piezometers not suitably located will be abandoned. The specific wells that are proposed for abandonment should be identified.

Response 13: Section 3.1.3 of the Revised Draft Work Plan (Well Abandonment) has been revised to reference the list of wells/piezometers presented in Table 2-1 that will be abandoned, and their locations shown on Figure 3-1.

Comment 14: Section 4.1.1 Pre-Construction Tasks, Monitoring Well Abandonment, page 4-4:
This section notes that existing wells or piezometers not suitably located will be abandoned. The specific methods that are proposed for well abandonment (and proposed modifications from the methods identified in the Trust SOP for well abandonment) should be described.

Response 14: Section 3.1.3 of the Revised Draft Work Plan (Well Abandonment) has been revised to summarize the methods to be used for well abandonment.

Comment 15: Section 4.1.1 Pre-Construction Tasks, Building 228 Oxygen Releasing Compound Injection, page 4-4:
The specific schedule requirements for this activity should be described in this section.

Response 15: Section 3.1.7 of the Revised Draft Work Plan (Building 228 RU Corrective Action) and Figure 6-1 (Corrective Action Implementation Schedule) have been revised to indicate the specific schedule requirements for the corrective action components. MACTEC will conduct the ORC Advanced™ injection in the 228 RU area approximately 1 month after the pre-construction groundwater monitoring and two months prior to initiation of excavation activities.

Comment 16: Section 4.1.1 Pre-Construction Tasks, Monitoring Well Installation, page 4-4:
This section indicates that the new well proposed for down-gradient monitoring of the Building 228 ORC® is anticipated to be installed prior to the ORC® injection. The timing of the installation of this well is crucial to the monitoring of the ORC® and this section should describe the activities that will be undertaken to ensure that this well is installed and monitored prior to the injection of the ORC®.

Response 16**:** Section 3.1.7 of the Revised Draft Work Plan (Building 228 RU Corrective Action) and Figure 6-1 (Corrective Action Implementation Schedule) have been revised to indicate the New Well 1 will be installed approximately one month prior to ORC Advanced™ injection and three months prior to initiation of excavation.

Comment 17: Section 4.1.2 Construction Tasks, page 4-5:
This section indicates that the excavation contractor will conduct a pre-excavation topography survey. This discussion should describe how this survey is different from the pre-construction survey conducted by MACTEC and described in Section 4.1.1 Pre-Construction Tasks.

Response 17**:** Section 3.1.9 of the Revised Draft Work Plan (Pre-Construction Surveying) has been revised to clarify the scope of the pre-construction surveys.

Comment 18: Section 4.1.2 Construction Tasks, page 4-5:
The specific requirements for the pre-construction topographic survey, including the limits and datum, should be discussed.

Response 18: Section 3.1.9 of the Revised Draft Work Plan (Pre-Construction Surveying) has been revised to clarify the limits and datum of the pre-construction surveys.

Comment 19: Section 4.1.2 Construction Tasks, page 4-5:
This discussion indicates that the pavement within the "remedial limits" will be removed. This description should be expanded to indicate the difference between "remedial limits," limit of excavation area, and soil remedial unit. The latter two terms are depicted as different on work plan figures while "remedial limits" are not defined on any of the figures.

Response 19: The Revised Draft Work Plan has been revised to eliminate use of the term "remedial limits" and to clarify the limits of the remedial units and excavation areas in Section 2.0. The soil remedial unit is the area of soil contamination that contains COCs at concentrations exceeding cleanup levels within an RU. The soil remedial units are depicted on Figure 1-8. Where physical features (i.e., historic building, Doyle Drive overpass, etc.) exist that preclude excavation, the planned excavation areas are smaller than the soil remedial unit areas. The planned excavation areas are referred to as Assumed Excavation Areas and are depicted on Figures 2-2A and 2-2B.

Comment 20: Section 4.1.2 Construction Tasks, page 4-5:
The discussion of temporary road closures and traffic control should refer to and be consistent with the traffic control plan.

Response 20: Section 3.1.11 of the Revised Draft Work Plan (Traffic Control Plan) has been revised to summarize the temporary road closures and traffic controls that are consistent with the details of the plan presented in Appendix B (Traffic Control Plan).

Comment 21: Section 4.1.2 Construction Tasks, page 4-5:
This section discusses the post excavation survey and the final record topographic survey. The text should be revised to clarify whether these are two separate surveys. In either case, the limits of the surveys, as well as the datum, should be described. In addition, the discussion should describe how the survey will be coordinated to include other features installed post-excavation, such as groundwater monitoring wells and ORC® injection locations.

Response 21: Section 3.2.7 of the Revised Draft Work Plan (Excavation Record Survey) has been revised to clarify that the post excavation survey will depict the topographic conditions following completion of excavation and confirmatory sampling, but prior to the backfilling. The final record topographic survey will depict the topographic condition following completion of backfill activities and installation of utilities. The control limits and the datum to be used for the horizontal and vertical surveying are referenced as being based on the same horizontal and vertical control datums described under Section 3.1.9 (Pre-Construction Surveying).

Comment 22: Section 4.1.2 Construction Tasks, page 4-6:
This discussion indicates that cultural resource protection guidelines are described in Section 4.5.1. Section 4.5.1 was not included in the copy of the document provided for NPS review. This section should be provided or the reference revised.

Response 22: Section 3.2.4 of the Revised Draft Work Plan (Protection of Resources) includes a discussion of cultural and other resource protection guidelines.

Comment 23: Section 4.1.2 Construction Tasks, page 4-6:
This section indicates that utility work may be performed before, during, or after the Building 231 abatement and demolition work but does not provide a description of the proposed utility work. The utility work that is proposed should be described in this work plan.

Response 23: Sections 3.1 and 3.2 of the Revised Draft Work Plan (Pre-Construction and Construction Activities) have been revised to clarify the utility work that will be performed. Subsurface utility clearances are described in Section 3.1.6; the utility decommissioning required prior to initiation of excavation activities are described in Section 3.1.12; temporary utility service connections are described in Section 3.1.13; and the required utility replacement following completion of site excavation activities are described in Section 3.2.9.

Comment 24: Section 4.1.3 Post-Construction Tasks, page 4-7:
The proposed assessment of the potential for vapor phase intrusion should be completed prior to the post-construction period so that any work that is needed, based on this assessment, can be described in this work plan.

Response 24: Section 3.1.7 of the Revised Draft Work Plan (Building 228 RU Corrective Action) and Figure 6-1 (Corrective Action Implementation Schedule) have been revised to indicate the specific schedule requirements for the corrective action components. EKI will conduct indoor air and soil vapor sampling in accordance with Appendix H (Indoor CAP Corrective Action, Building 228 RU). Section 5.4, Table 1-1, and Figure 1-9, respectively, present the documentation procedures for the Building 228 Indoor CAP Corrective Action, the project team responsibilities, and scheduling associated with this corrective action. The results of the investigation and improvements conducted, if necessary, will be included in the Construction Completion Report.

Comment 25: Section 4.2.1 Former Building 207 Remedial Unit (Including Former Building 208 Sump Area), page 4-10:
The description of the work that will be performed at this site should be expanded to include complete removal of the LTTD treated backfill placed in this area by the Army.

Response 25**:** Section 2.1.4 of the Revised Draft Work Plan (Former Building 207 Remedial Unit (Including Former Building 208 Sump Area) has been revised to clarify that low temperature thermal desorption (LTTD) treated soil formerly placed as backfill within the Building 207 RU area will be removed and disposed off-site by the excavation contractor.

Comment 26: Section 4.2.1 Former Building 207 Remedial Unit (Including Former Building 208 Sump Area), page 4-10:
The procedures that are proposed for any encounter with LTTD treated soil at this site ("notify the Trust") do not appear to have been developed for this particular site where removal of LTTD treated soil is one of the objectives.

Response 26: Section 2.1.4 of the Revised Draft Work Plan (Former Building 207 Remedial Unit (Including Former Building 208 Sump Area)) has been revised to clarify that removal of LTTD treated soil is a site-specific objective of the corrective action for this RU.

Comment 27: Section 4.2.1 Former Building 207 Remedial Unit (Including Former Building 208 Sump Area), page 4-10:
This description of the proposed work indicates that any contamination that is not removed vertically, will remain in place under an installed visual marker, and be subject to a LUC. This approach does not appear to be consistent with the description of the remedy presented in the CAP. This work plan should be revised to be consistent with the selected remedy in the CAP and the future site use.

Response 27: Section 2.0 of the Revised Draft Work Plan (Corrective Actions) has been revised to clarify the constraints on excavation that may result in contaminated soil remaining in place under an installed visual marker for which a temporary or permanent LUC would

be implemented. The CAP recommends excavation and off-site disposal of soil for all RUs, except the Building 228 RU. While the excavation contractor will make every effort to remove soil containing COCs above cleanup levels in the four RUs for which excavation is the approved corrective action, at locations where physical structures or adjacent remediation sites exist, the horizontal limits of over-excavation will be restricted. As described in Section 2.1.6 (Horizontal Limits of Excavations) and Section 2.1.8 (Land Use Controls), if excavations are terminated before cleanup levels are met, the Contractor will install a visual subsurface marker (such as a permeable geotextile material) to identify the extent of the excavation. Additionally, a licensed land surveyor subcontracted by the Contractor will survey the toe of the horizontal excavation limits (to be used to delineate LUCs).

Comment 28: Section 4.2.1 Former Building 207 Remedial Unit (Including Former Building 208 Sump Area), Northern and Western Boundary of Former Building 207 RU, page 4-11:
The proposal to provide a LUC for any contamination that extends into either Mason or Halleck Streets instead of clean closing these portions of the site does not appear to be consistent with the CAP or consistent with the future site use. This work plan should be revised to be consistent with the remedy selected in the CAP and the future site use.

Response 28: Section 2.1.6 of the Revised Draft Work Plan (Horizontal Limits of Excavations) has been revised to indicate that excavation beneath roadways other than a portion of Gorgas Avenue is not anticipated, and to provide the criteria for over-excavation decisions the Trust will confer on with stakeholders to determine if excavation underneath a roadway is warranted. regarding locations where the horizontal limits of over-excavation will be restricted

Comment 29: Section 4.2.2 Former Building 38, 38-A, and Garage Area Remedial Unit, Corrective Action, page 4-12:
This description indicates that contaminated soil will be removed for off-site disposal but does not discuss if any attempt will be made to segregate potential clean soils, such as overburden soil, and how this material would be disposed if it is encountered. The work plan should describe how potential clean soils that may be encountered would be managed.

Response 29: Section 2.0 of the Revised Draft Work Plan (Corrective Actions) has been revised to clarify that segregation will not be performed to separate overburden from impacted soils, and all excavated soils will be disposed off-site. Section 2.1.3 clarifies this for Former building 38, 38A, and Garage Area Remedial Unit.

Comment 30: Section 4.2.2 Former Building 38, 38-A, and Garage Area Remedial Unit, Corrective Action, page 4-13:
This description of the proposed work indicates that any contamination that is not removed vertically, will remain in place under an installed visual marker, and be subject to a LUC. This approach does not appear to be consistent with the

description of the remedy presented in the CAP. This work plan should be revised to be consistent with the selected remedy in the CAP and the future site use.

Response 30: Please see Response to Comment 27.

Comment 31: Section 4.2.2 Former Building 38, 38-A, and Garage Area Remedial Unit, Corrective Action, page 4-13:
This discussion indicates that if contamination is found to extend under Marshall Street that the "Project Team" will evaluate excavation of the impacted areas of the street. The nature of this evaluation, and whether it would include consideration of the CAP selected remedy should be described in this work plan. In addition, the project team identified in Section 3.1, Project Team Points of Contact, includes more individuals than appears appropriate for this type of discussion. The work plan should describe how members of the Project Team would be excluded if all are not to be involved.

Response 31: Please see Response to Comment 28. The stakeholders that will participate in this discussion are MACTEC, the Contractor, the Trust, NPS, RAB, Water Board, and DTSC.

Comment 32: Section 4.2.3 Existing Building 231 Remedial Unit (Including Former Building 271 Area), Corrective Action, page 4-15:
This discussion indicates that the Trust will demolish Building 231 while the discussion on page 4-6 (Section 4.1.2 Construction Tasks) indicates that the excavation contractor will do this demolition. The document should be revised to correct this ambiguity.

Response 32: Section 1.4 of the Revised Draft Work Plan (Corrective Action Contracting) has been updated to indicate that the demolition of Building 231 will be completed prior to initiation of the corrective actions; therefore, the details of the demolition scope and specifications will be provided by the Trust for review under separate cover, and are no longer discussed in Section 3.0 (Corrective Action Implementation for Soil and Groundwater). The Trust will contract with a demolition contactor for the demolition of Building 231.

Comment 33: Section 4.2.3 Existing Building 231 Remedial Unit (Including Former Building 271 Area), Corrective Action, page 4-15:
This description of the proposed work indicates that any contamination that is not removed vertically, will remain in place under an installed visual marker, and be subject to a LUC. This approach does not appear to be consistent with the description of the remedy presented in the CAP. This work plan should be revised to be consistent with the remedy selected in the CAP and the future site use.

Response 33**:** Please see Response to Comment 27.

Comment 34: Section 4.2.3 Existing Building 231 Remedial Unit (Including Former Building 271 Area), Corrective Action, Northeastern Boundary of Building 231 RU, page 4-16: This description of the proposed work indicates that any contamination that is not removed in the area of Gorgas Avenue adjacent to the RU will remain in place under an installed visual marker, and be subject to a LUC. This approach does not appear to be consistent with the description of the remedy presented in the CAP. This work plan should be revised to be consistent with the remedy selected in the CAP and the future site use.

Response 34: Please see Response to Comment 27.

Comment 35: Section 4.2.5 Existing Building 228 Remedial Unit, page 4-21: A description of the assessment that is proposed for Building 228 should be provided in this work plan.

Response 35: Section 3.1.7 of the Revised Draft Work Plan (Building 228 RU Corrective Action), Appendix E (Oxygen Releasing Compound Injection, Northern Portion of Building 228 Remedial Unit), and Section 5.0 (Reporting and Corrective Action Implementation Documentation) have been revised to clarify the assessment, decision making and documentation procedures for the Building 228 RU.

Comment 36: Section 4.3.1 Runoff Controls, page 4-23: This description of runoff controls is written as if some water runoff from contaminated soil areas would be allowed. Runoff from contaminated areas should be prohibited and this work plan should be revised to clearly state this prohibition.

Response 36: Section 3.1.10 of the Revised Draft Work Plan (Storm Water Pollution Prevention and Erosion Control Measures) and Appendix A (Storm Water Pollution Prevention Plan) have been revised to clarify that runoff from contaminated areas will be prohibited, and to describe the Best Management Practices (i.e., straw wattles around excavation areas, straw wattles around catch basins within the project area, and placement of silt fence fabric under catch basin grates in areas subjected to vehicles and bicycle traffic) that will be deployed prior to initiation of site construction activities to minimize storm water runoff and sediment load in stormwater runoff.

Comment 37: Section 4.3.11 Road Closures, Building 207 RU, page 4-29: This discussion indicates that "revisions to the road closure and transportation plan criteria sensitive to the requirements of the Crissy Field Center summer program…will be specified in the Construction Documents." These elements should be identified in this work plan and the Traffic Control and Signage Plan so that others who may be impacted by the criteria used for this consideration can review the nature of the impacts.

Response 37: Section 3.1.11 of the Revised Draft Work Plan (Traffic Control Plan) has been revised to summarize the temporary road closures and traffic controls that are consistent with the details of the plan presented in Appendix B (Traffic Control Plan), which indicates if additional road closures are required, they will be discussed during weekly stakeholder

meetings and appropriate stakeholders will be solicited for input prior to initiation of additional road closures.

Comment 38: Section 4.4 Resource Protection and Safety, page 4-31:
This section should be revised to require that work be stopped immediately in an area where a potentially sensitive or significant cultural resource or artifact is discovered.

Response 38: Section 3.2.4.1 of the Revised Draft Work Plan (Resource Protection and Safety Protocols) has been revised to clarify that work be stopped immediately in an area where a potentially sensitive or significant cultural resource or artifact is discovered.

Comment 39: Section 4.6.2 Permitting, page 4-36:
The fourth bullet in this section describes that an encroachment permit from Caltrans may be needed and that such a determination would be made during the "design process." Since the design process will be complete with the submittal of the work plan and construction documents, this description of the need for an encroachment permit should be revised to describe when this determination will be made.

Response 39: Please see Response to Comment 11.

Comment 40: Section 4.7.1 Excavation of Impacted Soil, page 4-40:
This section should be expanded to describe how the initial excavation limits will be determined in the field by the Trust and the Contractor. Will the process used for the Commissary/PX excavation be used, or will an alternate method be employed? A comment similar to this was previously made as Comment #31 in the February 9, 2006 NPS comments on the Commissary/PX Draft Phase I Corrective Action Plan Work Plan, dated January, 2006 and December, 2005.

Response 40: Please see Response to Comments 17 and 18 that indicate the methods, controls, and datum for determining the initial limits of the assumed excavation areas that will be surveyed by a licensed land surveyor are described in Section 3.1.9 of the Revised Draft Work Plan (Pre-Construction Surveying).

Comment 41: Section 4.7.1 Excavation of Impacted Soil, page 4-40:
This section should be expanded to discuss the requirement that the trench backfill material that was used for the Geoarchaeological trenches be removed as part of these excavations. As noted in the September 12, 2006 NPS comments on the Appendix A Draft Environmental Field Report Subsurface Geoarchaeological Survey of the Building 207/231 Area, (yellow highlighted redline version) dated August 14, 2006, the material used for the backfill of these trenches was above site cleanup levels and needs to be removed.

Response 41: Section 3.2.6.1 of the Revised Draft Work Plan (Soil Excavation) has been revised to clarify that all trench backfill material that was used for the geoarchaeological trenches will be removed as part of the corrective action excavations. Figures 2-2A and 2-2B

show the locations of the trenches that have been incorporated into the assumed excavation areas.

Comment 42: Section 4.7.1 Excavation of Impacted Soil, page 4-41:
The proposed and anticipated use of gravel in the bottom of each excavation does not appear to be necessary, is not consistent with the future use of this area, and should not be included with the proposed work.

Response 42: Section 3.2.8.1 of the Revised Draft Work Plan (Backfill Material and Specifications) has been revised to indicate that gravel will not be used for backfilling, and the excavations will be backfilled with natural sands (e.g., from Quail Hollow Quarry, Felton, California) to the final restored surface elevation in 231 RU (to the south of Gorgas Avenue) area and in the landscaped areas of 207 RU and 38 RU. In the 230 RU and the paved sections of the 231 RU, 207RU, and 38 RU, natural sand will be used to the bottom of the subgrade for the pavement. The subgrade for the pavements will consist of Class II Aggregate Base.

Comment 43: Section 4.7.2 Excavation Edge Conditions, page 4-42:
This discussion indicates that excavation will proceed to the limits of the RU and not the limits of the excavation area. The description of the limits of the initial excavation should be consistent within the work plan and construction documents.

Response 43: Please see Responses to Comments 19 and 27 that indicate the Revised Draft Work Plan has been revised to eliminate use of the term “remedial limits” and to clarify the limits of the remedial units and excavation areas in Section 2.0 (Corrective Actions).

Comment 44: Section 4.7.2 Excavation Edge Conditions, page 4-42:
This section indicates that the excavation edges adjacent to surface features will have a specified set-back and will be sloped. This approach does not appear to consider the other options that exist to maximize the contamination that is removed and the potential impact that this has on the design of the confirmation sampling program. The work plan should be revised to allow vertical edges when safe and to employ benching techniques as an alternate approach for edge stability control, especially in shallow excavations.

Response 44: Please see Response to Comment 19. The specified setbacks in Section 2.1.6 of the Revised Draft Work Plan (Horizontal Limits of Excavation) are based on Cal Trans Requirements (for excavations abutting Doyle Drive Overpass) and site-specific geotechnical considerations (east and west of Building 230 and the historic wall to the north of Building 228). While the setback to the Doyle Drive overpasses are a Cal Trans requirement and have to be maintained, the other noted setbacks could be modified in the field by the Contractor, if he deems the excavation to be stable. To the extent practicable, the Contractor will use hand held equipment (e.g., shovels, etc.) to remove soils containing COCs above cleanup levels, adjacent to Building 230 and the historic wall.

Comment 45: Section 4.7.2 Excavation Edge Conditions, page 4-42:
This section describes that an encroachment permit from Caltrans may be needed and that such a determination would be made during the "design process." Since the design process should be complete with the submittal of the work plan and construction documents, this description of the need for an encroachment permit should be revised to describe when this determination will be made.

Response 45: Please see Response to Comment 11.

Comment 46: Section 4.7.2 Excavation Edge Conditions, page 4-43:
This discussion indicates that the work plan defines the RU excavation edges by the top of the excavation. This is not consistent with the RUs defined in the CAP and should be revised. This approach, when combined with the proposed sidewall geometry, will not remove all of the contamination that is documented in the CAP.

Response 46: The Revised Draft Work Plan has been revised to indicate the RU excavation edges will be defined by the toe of the excavations. The assumed areas of excavation have been accordingly revised (see Figures 2-2A and 2-2B). Where physical features (i.e., historic building, Doyle Drive overpass, etc.) or adjacent remedial site (Fill Site 6B) exist that restrict access to excavation equipment, the planned excavation areas are smaller than the soil remedial unit areas as described in Section 2.1.6 (Horizontal Limits of Excavations). The planned excavation areas are referred to as Assumed Excavation Areas and are depicted on Figures 2-2A and 2-2B.

Comment 47: Section 4.7.2 Excavation Edge Conditions, Former Building 38 and Building 230 RUs, page 4-43:
Although this discussion indicates that these excavations are sufficiently shallow to have vertical sidewalls, the proposed excavation plan, Figure 4-1 shows that vertical sidewalls are not proposed for this location. The proposed excavations should be revised to maximize the amount of contamination that is removed.

Response 47: Section 2.1.6 (Horizontal Limits of Excavations) has been revised to describe the setbacks and their basis for these RUs, and Figures 2-2A and 2-2B have been revised to show the assumed excavation area configurations For the Building 38 RU, the setback and the sidewall geometry are based on Cal Trans requirements. For the Building 230 RU, the setback and sidewall geometry are based on site-specific geotechnical considerations. While the setback to the Doyle Drive overpass is a Cal Trans requirement and must be maintained, the other noted setbacks could be modified in the field by the Contractor, if they deem the excavation to be stable. To the extent practicable, the Contractor will use hand held equipment (e.g., shovels, etc.) to remove soils containing COCs above cleanup levels, adjacent to Building 230 and the historic wall.

Comment 48: Section 4.7.5 Soil Stockpiles, page 4-46:
This section indicates that although this work plan shows some potential locations for the soil stockpiles, their actual location will be determined by the Trust and the

Contractor. This work plan should be revised such that the soil stockpile locations are limited to areas depicted in this work plan.

Response 48: Section 3.2.6.4 (Stockpile Management and Profiling) and Figure 1-2 of the Revised Draft Work Plan have been revised to indicate the proposed soil stockpile and staging areas actual locations within the Site.

Comment 49: Section 4.7.6 Stockpile Soil Sampling and Analysis for Disposal, page 4-47: Since the contractor is proposed to be collecting samples for laboratory analysis, the work plan should be revised to describe the sampling and analytical methods that the contractor will be employing and how the contractor will be informed of the Trust's QAPP requirements.

Response 49: Section 3.2.6.4 (Stockpile Management and Profiling) of the Revised Draft Work Plan has been revised to indicate the sampling and analytical methods that the Contractor will be responsible for implementing in accordance with the Presidio-Wide QAPP to determine landfill profiling requirements.

Comment 50: Section 4.7.7 Loading, Off-Haul, and Disposal of Soil, page 4-48: This discussion indicates that the minimum amount of soil and demolition materials that are anticipated is 18,000 cubic yards. The discussion on page 4-40 indicates that approximately 9,200 cubic yards of soil will be removed. This apparent discrepancy should be resolved or explained.

Response 50: Sections 3.2.6.1 (Soil Excavation) and 3.2.6.5 (Soil Off Hauling) of the Revised Draft Work Plan have been updated to consistently indicate the approximate estimated volume of excavation soils from the assumed excavation areas is approximately 23,000 cubic yards.

Comment 51: Section 4.7.8 Contingency Plans, Unexploded Ordnance, page 4-51: The specifics of how to react to the discovery of potential UXO should be included in this plan. The current plan presented, for the Trust and Engineer to "coordinate a response with Park Dispatch and all other interested parties" does not adequately describe the actions that are required by the current Trust or GGNRA UXO discovery procedures.

Response 51: Section 3.2.6.6 of the Revised Draft Work Plan (Contingency Actions) has been revised to indicate the procedures of how to react with the discovery of potential UXO will be in accordance with GGNRA UXO discovery procedures. MACTEC and the Trust will provide this guidance to the selected excavation contractor during the kick-off meeting.

Comment 52: Section 4.8 Backfill and Grading, page 4-51: The work plan indicates that the contractor will identify import sources that meet the criteria in the Construction documents but does not indicate what these requirements are or how they provide backfill that is consistent with the future site use. The work plan should be revised to discuss how the backfill selections will be made and the criteria that will be used for this selection.

Response 52: Please see Response to Comment 42. Section 3.2.8.1 of the Revised Work Plan (Backfill Material Specifications) has been revised to summarize the information provided in the accompanying Construction Documents that indicates: how the backfill selections will be made; the criteria that will be used for their selection; compaction requirements; and that gravel will not be used for backfilling

Comment 53: Section 4.8 Backfill and Grading, page 4-51:
This section indicates that "Trust approved materials" will be used for backfill of the Building 38, 207, 208, and 230 excavations. The nature and suitability of this material should be described in this work plan.

Response 53: Please see Responses to Comments 42 and 52.

Comment 54: Section 4.8 Backfill and Grading, page 4-52:
As noted in Comment #42, use of gravel for excavation backfill would generally not be appropriate given the reuse anticipated for this site and should not be proposed in this work plan. The work plan should be revised to use techniques other than gravel placement to accomplish the required objectives.

Response 54: Please see Responses to Comments 42 and 52.

Comment 55: Section 4.8 Backfill and Grading, page 4-52:
The discussion of the backfill of the Building 231 excavation should include a figure and cross section that describe the planned soil and groundwater surfaces.

Response 55: The Revised Draft Work plan has been updated to include a plan view of the restored surface at Building 231 RU depicted on Figure 3-3, and a cross-sectional view depicted on Figure 3-3.

Comment 56: Section 4.8 Backfill and Grading, page 4-52:
This discussion indicates that onsite fill material may be used for the backfill at the Building 231 site but does not describe the source of this fill material. The work plan should identify where the proposed onsite backfill borrow source is located.

Response 56: Please see Responses to Comments 42 and 52.

Comment 57: Section 4.8 Backfill and Grading, page 4-52:
This discussion of backfill indicates that it is anticipated that the backfill will include some gravel material. As noted in Comments #42 and #54, the use of gravel for excavation backfill would generally not be appropriate given the reuse anticipated for this site and should not be proposed in this work plan. The work plan should be revised to use techniques other than gravel placement to accomplish the required objectives.

Response 57: Please see Responses to Comments 42 and 52.

Comment 58: Section 4.8 Backfill and Grading, page 4-52:
This discussion indicates that backfill material placed greater than two feet below finish grade will be placed in loose lifts and compacted, but does not describe the criteria that will be used for this compaction. The compaction criteria (maximum and minimum) should be specified and be suitable for the anticipated future site use.

Response 58: Please see Responses to Comments 42 and 52.

Comment 59: Section 4.8 Backfill and Grading, page 4-52:
The discussion of compaction criteria should be revised to provide specific criteria and reviewed to ensure that both maximum and minimum criteria are used appropriately.

Response 59: Please see Response to Comment 52. Section 3.2.8.1 of the Revised Work Plan (Backfill Material Specifications) has been revised to summarize the information provided in the accompanying Construction Documents that indicates: how the backfill selections will be made; the criteria that will be used for their selection; compaction requirements; and that gravel will not be used for backfilling.

Comment 60: Section 4.8.1 Stormwater Drainage, page 4-53:
The location of the concrete curb that is proposed near Building 228 should be shown on one of the figures.

Response 60**:** The Revised Draft Work Plan has been revised to indicate that a new concrete curb is not proposed near Building 228. Current site topography indicates that storm water to the south of the southeast corner of the Building 231 RU (and to the northeast of Building 228) drains toward an existing drain inlet, located to the south of Building 230. Following completion of backfilling of the Building 231 RU, the Contractor will field verify existing drainage in this area toward this drain inlet. The Contractor will field adjust the site topography in this area to direct storm water toward this existing drain inlet.

Comment 61: Section 4.10 Site Restoration and Improvements, page 4-54:
The Trust's Building 207/231 design workshop held on November 8, 2006 included discussion of the Gorgas Avenue right of way and the desired dimensions for traffic and pedestrian lanes. The notes from that meeting reflect that a 5 foot wide pedestrian trail was agreed upon. This work plan discussion indicates that a wider trail is proposed. This difference should be discussed and explained.

Response 61: Section 3.2.8.2 of the Revised Draft Work Plan (Final Site Restoration of the RUs) has been revised to indicate the thickness of the trail will be 5 feet in accordance with the agreements in the November 8, 2006 design workshop.

Comment 62: Section 4.10 Site Restoration and Improvements, page 4-55:
This section indicates that a section of the 72" storm drain line will be left uncovered following the backfill and grading. A figure or grading plan should be provided

which shows how this will be accomplished given the small change in elevation that is proposed for the area of the site where the drain pipe is located.

Response 62: Figure 3-3 of the Revised Draft Work Plan has been revised to indicate the final surface elevation of the Building 231 RU will be restored to 10 feet NAVD 88 elevation around a portion of a 72 inch storm drain, to the north of the manhole, located outside the southwest corner of Building 230. The pipe will be exposed provided the top is above 10 feet NAVD 88 elevation.

Comment 63: Section 4.10.2 Pavement Replacement, page 4-55:
The area of pavement removal at the Building 231 area should be depicted on a figure, given that the site will, for the most part, not be repaved. The figure should also show areas that will be repaved.

Response 63: Figures 3-2 and 3-3 of the Revised Draft Work Plan have been revised to show the area of pavement replacement for Building 231 RU.

The areas to the north of North Doyle Drive for the 207 RU and 38 RU will be landscaped to match existing conditions. The area between the Doyle Drive overpasses for the 207 RU and 38 RU excavations will be finished with asphalt pavement to match existing conditions. The Building 230 RU will be finished with asphaltic concrete.

Comment 64: Section 4.11 Building 228 Remedial Unit Corrective Actions, page 4-57:
The discussion of the proposed ORC® application rate should be expanded to include comparison to other Trust ORC® projects. This comparison would include the Building 637 project and the proposed application at the Building 1065 project. A comment similar to this was previously made in the December 26, 2006 NPS comments on the Draft Corrective Action Implementation Work Plan, Technical Specifications, and Drawings, Building 1065 Area, dated November 22, 2006.

Response 64: A comparison of site conditions, application quantities, and groundwater monitoring data at the Building 637 site relative to those at Building 207/231 site is presented in Appendix E (Section E-1.3, Evaluation of Building 637 CAP Site ORC Data) of the Revised Draft Work Plan.

Comment 65: Section 4.11 Building 228 Remedial Unit Corrective Actions, page 4-57:
This discussion of the proposed ORC® application rate indicates that if the proposed ORC® application rate is refined during the design process, the revision will be documented in this work plan or the Construction Completion Report. The additional work that is being done as part of the design that would impact the rate should be described. In addition, the proposed rate should be presented in a forum, such as this work plan, not the Construction Completion Report, that can be reviewed by the stakeholders prior to the ORC® application.

Response 65: Appendix E of the Revised Draft Work Plan have been revised to describe the process and reporting requirements for potential refinement of the ORC Advanced™ based on downgradient groundwater monitoring results from New Well 1.

Comment 66: Section 4.11 Building 228 Remedial Unit Corrective Actions, page 4-57: The calculations which support this discussion, that the ORC® application will reverse the local reducing conditions in the aquifer, should be provided.

Response 66**:** Please see Response to Comment 65.

Comment 67: Section 6.0 Construction Completion Report, page 6-1: The construction completion report should discuss the QA/QC results and impact on the collected data, in addition to the items listed in this section.

Response 67**:** Section 5.7 of the Revised Draft Work Plan has been revised to clarify the Construction Completion Report will include the QA/QC results for the samples collected during all corrective action activities.

Comment 68: Section 7.0 Schedule and Project Deliverables, page 7-1: The proposed schedule should be presented and discussed in this section.

Response 68**:** Section 6.0 (Project Schedule) and Figure 6-1 of the Revised Draft Work Plan have been updated to present the proposed project schedule for the project.

Comment 69: Section 7.0 Schedule and Project Deliverables, page 7-1: The list of Contractor Project Deliverables in this section includes geotechnical test reports. The geotechnical testing that is proposed in this project should be described in this work plan. The work plan currently does not include discussion of geotechnical tests other than backfill compaction.

Response 69**:** Section 3.3.2 of the Revised Draft Work Plan (Post-Construction Contractor Submittals) has been revised to indicate the excavation contractor will be required to submit the geotechnical test reports confirming compliance with compaction criteria listed in Section 3.2.8.1 (Backfill Material Specifications).

Comment 70: Section 7.0 Schedule and Project Deliverables, page 7-1: The lists of Contractor and Engineer Project Deliverables should include the as-built drawings. Currently only the final topographic survey as-built is included.

Response 70: Section 3.3.2 of the Revised Draft Work Plan (Post-Construction Contractor Submittals) has been revised to list all submittals required of the contractor, including as-built drawings.

Comment 71: Section 7.0 Schedule and Project Deliverables, page 7-1: The list of Engineer Project Deliverables appears to be missing several key items, such as confirmation testing results. These additional items should be included as well as the basis for this list should be discussed.

Response 71: Section 5.7 of the Revised Draft Work Plan (Construction Completion Report) has been updated to include a comprehensive list of analyses and reporting data required of the engineer.

Comment 72: Section 7.0 Schedule and Project Deliverables, page 7-1:
The list of Trust responsibilities indicates that the Trust will be conducting a California Environmental Quality Act (CEQA) analysis for this project. This analysis should be provided for stakeholder review.

Response 72**:** Section 6.0 (Project Schedule) has been revised to eliminate the reference to a CEQA analysis, which is not required for the project.

Comment 73: Section 7.0 Schedule and Project Deliverables, page 7-1:
The work plan identified several contracts, in addition to the excavation contract, that will be needed for this project. The responsibility for these additional contracts is not included in the responsibilities of the excavation contractor, the engineer, or the Trust, as listed in this section. The responsibility for these major project elements should be identified.

Response 73**:** Section 1.4 of the Revised Draft Work Plan (Corrective Action Contracting) has been updated to identify the four contractors that will perform the field work required to implement the corrective actions, and Sections 4.0 (Construction Documentation) and 5.0 (Reporting and Corrective Action Implementation Documentation) summarize the details, specifications, and reporting requirements for each of the corrective action components that will be provided for review.

Comment 74: Table 3-1 Project Team Responsibilities:
This listing of responsibilities appears to be an abbreviation of the total responsibilities identified in the work plan. For example, the involvement of all of the stakeholders during over excavation activities is an important project element and is partially discussed in the work plan, but not included in this table. The purpose of this table should be described and the table expanded to more accurately represent the responsibilities of the stakeholders.

Response 74: Table 3-1 of the Revised Draft Work Plan has been updated to include the four contractors and stakeholders, and their responsibilities

Comment 75: Figure 1-6 Geologic Cross Section A-A':
The proposed excavation bottoms and sidewalls should be depicted on this figure and the additional cross section figures that follow.

Response 75**:** Figure 1-6 of the Revised Draft Work Plan has been updated to show the proposed excavation bottoms and sidewalls on the cross-section.

Comment 76: Figure 4-1 Proposed Excavation Plan:
The limits of excavation proposed by this figure do not agree with the limits of excavation presented in the CAP. This figure and work plan should be revised to

follow the requirements of the CAP and any differences should be clearly highlighted and described.

Response 76: Please see Response to Comment 19 that indicates Figures 2-2A and 2-2B of the Revised Draft Work Plan have been updated so that the RU excavation edges are defined by the toe of the excavations for the assumed excavation areas.

Comment 77: Figure 4-1 Proposed Excavation Plan:
This proposed excavation plan shows excavation geometries that do not appear to maximize the contamination that will be removed (or match those presented in the CAP). The basis for the proposed excavation geometries should be described.

Response 77: Please see Response to Comment 76.

Comment 78: Figure 4-2 Proposed Oxygen Release Compound Injection Plan:
The data points used for the potentiometric surface and the proposed excavation contour for the Building 231 Area should be shown on this figure.

Response 78: The Revised Draft Work Plan has been updated so that the referenced figure is now included as Figure E-1 of Appendix E. The initial limits of the assumed excavation in the southeastern portion of Building 231 RU excavation are shown on Figure E-1. The potentiometric surface of the shallow sand is plotted using data from the November 2005 Treadwell and Rollo groundwater monitoring event (*Treadwell and Rollo, 200*6). Because the areal extent of the map is small, the data points used to draw the potentiometric surface is not presented on the figure. These data points are presented on Figure 2-1 of the Revised Draft Work Plan.

Comment 79: Figure 4-3 Building 231 Remedial Unit Restoration and Grading Plan:
The discussions in previous portions of the work plan have indicated that the 72" storm drain will remain exposed following site restoration. This grading plan does not appear to show that the pipe will be visible following backfilling. This inconsistency should be resolved.

Response 79: Please see Response to Comment 62 that indicates a portion of the 72-inch storm drain (whose top of pipe elevation exceeds 10 feet NAVD 88), adjacent to the manhole, located outside the southwest corner of Building 230 will be exposed as shown on the updated Figure 3-3.

Comment 80: Figure 4-3 Building 231 Remedial Unit Restoration and Grading Plan:
The notes to this figure describe that the excavation will be backfilled to match adjacent conditions but neither here or in other sections of this work plan, is the nature or minimum criteria for the backfill material described.

Response 80: Please see response to Comments 42 and 52 regarding revisions to Section 3.2.8.1 of the Revised Draft Work Plan (Backfill Material and Specifications) that has been revised to indicate backfilling requirements, and Section 3.2.8.2 (Final Site Restoration of RUs) and

Figure 3-3 that have been revised to describe the updated grading plan for Building 231 RU area.

Comment 81: Figure 4-4 Historical High Water Elevations:
Additional information should be provided with this figure showing the historic groundwater elevations. This additional information would allow the user to determine not only the water elevations, but the expected depth to the groundwater surface.

Response 81: The Revised Draft Work Plan contains a new Figure J-1 of Appendix J shows the historic high groundwater elevations and final surface elevations for the Building 231 RU area relative to NAVD 88 datum. The appendix also presents the design basis for the grading plan design, which takes into consideration the expected depth to groundwater surface. The final grade has been designed to minimize surface expression of groundwater (see Appendix J for details).

Comment 82: Appendix A Storm Water Pollution Prevention Plan, page A1:
The introductory discussion for this appendix notes that the SWPPP should govern all erosion control and monitoring. This description should be expanded to not only describe what should be done, but what will be done. In addition, the proposed role of the Erosion Monitoring Plan (Appendix H) should be discussed.

Response 82: Appendix A of the Revised Draft Work Plan has been revised to clarify the storm water pollution prevention and the erosion control measures that will be implemented during and for the first year following construction. The separate erosion monitoring plan has been eliminated.

Comment 83: Appendix A Storm Water Pollution Prevention Plan, Objectives, page A1:
The description of the term of the application of this plan should be more precisely described. This current description indicates that the plan applies to the period of construction and the first wet season following construction. Since the project is currently planned to be constructed by the Trust during a wet season, the plan should specify whether the Trust will follow the plan for the entire year following construction completion.

Response 83: Appendix A of the Revised Draft Work Plan has been revised to clarify the duration of the activities during construction and for the first year following construction

Comment 84: Appendix A Storm Water Pollution Prevention Plan, Contact Information/List of Responsible Parties, page A2:
The duties of the WPCM are identified as to include "periodic inspections throughout the rainy season." The frequency of these inspections should be specified so that it is clear whether these periodic inspections are the same as the inspections that are discussed in the work plan text as weekly and following each storm event.

Response 84: Appendix A of the Revised Draft Work Plan has been revised to indicate MACTEC as the Trust's Construction Manager will conduct weekly monitoring and prior to and after

each storm event during construction. During the first year following construction, during the winter months, weekly inspection will be conducted. For the remainder of the year, monthly inspection will be conducted (see Section A-5-2).

Comment 85: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Inventory of Materials and Activities that May Pollute Storm Water, page A3:
The list of construction activities that may contribute sediment to storm water should be expanded to include backfilling operations and excavation of soil from the onsite borrow source area mentioned in the work plan text.

Response 85: Appendix A (Section A.3.2) of the Revised Draft Work Plan has been revised to update the list of construction activities that may contribute to storm water pollution discharges.

Comment 86: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Inventory of Materials and Activities that May Pollute Storm Water, page A3:
This section describes that the Contractor will "work out the details" regarding how stormwater which has contacted waste soil will be prevented from entering the storm drains. These details should be developed and presented in this plan, for review by the stakeholders, given the sensitivity of Crissy Marsh as the receiving water for storm drainage.

Response 86: Appendix A (Section A.4.0) of the Revised Draft Work Plan has been revised to clarify the BMPs to be followed by the excavation contractor to minimize storm water runoff from the excavation areas and to prevent erosion.

Comment 87: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Temporary Sediment Control, page A5:
This discussion indicates that the work is expected to occur in the dry season and describes how certain measures will be deployed because of this. The most recent schedule provided to the NPS, for this project, indicates that excavation will be initiated in December, 2007. Because the project will apparently be conducted in the wet season, not the dry season as described, this SWPPP should be reviewed and revised as necessary to address this change.

Response 87: The construction activities are planned for Summer 2008. The updated schedule is presented in Figure 6-1 of the Revised Draft Work Plan. Appendix A of the Revised Draft Work Plan has been revised to indicate BMP measures to be followed in the event of an unseasonal summer storm.

Comment 88: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Tracking Control, page A5:
This section indicates that wet washing of truck tires may be necessary but does not describe how or where this will occur. This SWPPP and the work plan should describe how this activity will be performed in order to ensure that the waste water generated by this washing will be captured and properly managed.

Response 88: Appendix A of the Revised Draft Work Plan has been revised to indicate the trucks will be staged on a paved surface along Old Mason Street, either just west of Building 610 or east of Marshall Street. The trucks will access the Site (and the stockpile area) along paved surfaces. Therefore, it is not anticipated that the truck tires will track significant dirt. As a contingency, however, rumble pads will be placed at the site exit for the trucks to prevent tracking offsite tracking of dirt. No wet washing of tires will be conducted (see Section A.4.5).

Comment 89: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Waste Management and Materials Pollution Control, page A6: This section indicates that the Trust will perform weekly inspection of the sediment control measures during the dry season, but during the wet season the inspection will only be performed after each storm. This requirement is not consistent with the similar discussion in the work plan text and is not adequate to control sediment discharges. During the wet season, inspections should be at least weekly and before and after major storm events.

Response 89: Please see Response to Comment 84.

Comment 90: Appendix A Storm Water Pollution Prevention Plan, Pollutant Source Identification and BMP Selection, Monitoring Program and Reports, page A7:
This section indicates that the contractor will be required to provide notice and file a report following any discharge. The plan should describe how this requirement will be met following release of the contractor after construction.

Response 90: Appendix A of the Revised Draft Work Plan has been revised to indicate in case of non-compliance with the SWPPP, MACTEC will notify the Water Board as soon as the discharge occurs (see Section A.5.3.1).

Comment 91: Appendix C Dewatering Plan, Disposal, page C2:
This discussion indicates that secondary containment will be required for onsite water storage. The nature and the minimum amount of the secondary containment should be described.

Response 91: Appendix C of the Revised Draft Work Plan has been revised to clarify that the Contractor will have two 21,000 gallon baker tanks onsite for water storage.

Comment 92: Appendix C Dewatering Plan, Disposal, page C3:
This discussion indicates that the collected water may be transported off-site for disposal by treatment or recycling. The nature or minimum requirements for the off-site management of waste water should be described.

Response 92: Appendix C of the Revised Draft Work Plan has been revised to clarify that MACTEC will sample the extracted water from the tanks once every month for the analytes listed in the Trust's Industrial Waste Water Discharge Permit. Provided the concentrations are

below the discharge limits, the extracted water will be discharged to the Trust's sanitary sewer system.

However, if the concentrations of any of the analytes exceed discharge limits, then the Contractor will identify off-site disposal facilities to be used for discharge of water. The Contractor will provide MACTEC, the Trust, the NPS, and other stakeholders, a plan for offsite disposal of the water in weekly stakeholder meetings for review and approval prior to arranging for offsite disposal.

Comment 93: Appendix C Dewatering Plan, Methods of Dewatering, page C3:
This description indicates that the contractor will be allowed to install a pumped well dewatering system. The details of this potential system should be described in this plan and include a description of how the system would be removed at the end of the construction.

Response 93: No pumped wells are anticipated for dewatering. If pumped wells are necessary, then MACTEC will provide the Trust, the NPS, and other stakeholders, a design for a pumped well system in weekly stakeholder meetings for review and approval prior to implementation.

Comment 94: Appendix C Dewatering Plan, Summary, page C3:
This description of the excavation dewatering should be expanded to indicate whether the dewatering system will be required to be in operation for the entire time that the excavations are below the groundwater levels or whether the system may be operated intermittently, as the Trust has allowed on other recent projects. If intermittent operations are allowable, the nature of the safeguards that will be employed to protect the safety of park visitors and the nearby environment during times when the excavations are flooded should be described.

Response 94: The excavation dewatering will be intermittent. The excavation contractor will be permitted to dewater only when necessary (i.e., during excavation and/or backfilling). As a safeguard, temporary construction fence will be installed around the project area to limit access to the project site during construction activities.

Comment 95: Appendix E Oxygen Releasing Compound Injection Proposal, Building 228 Remedial Unit, page 1 of December 4, 2006 letter from Regenesis:
This letter indicates that Regenesis has reviewed the information that was provided by Mactec but this appendix does not describe the nature or elements of this information. The information that was used as the basis for the ORC® application rates should be identified.
A comment similar to this was previously made as Comment #32 in the December 26, 2006 NPS comments on the Draft Corrective Action Implementation Work Plan, Technical Specifications, and Drawings, Building 1065 Area, dated November 22, 2006.

Response 95: Historical site groundwater analytical data (from ORC treatment area), site geologic cross-sections, and soil and groundwater data and plates from the CAP related to the Building 228 RU were provided to Regenesis for consideration in their design.

Comment 96: Appendix E Oxygen Releasing Compound Injection Proposal, Building 228 Remedial Unit, page 1 of December 4, 2006 letter from Regenesis:
The Regenesis author of the provided letter indicates that the ORC® proposal is preliminary and that additional work is required to develop a site-specific strategy. This additional work should be completed and presented prior to the completion of this work plan.

Response 96: The design basis and the design for the ORC Advanced™ are presented in Section E-2.2.1, Appendix E of the Revised Draft Work Plan. The Regenesis proposal letter notes that the design is preliminary because additional data is to be collected from the pre construction groundwater monitoring from well, New Well 1. If this data indicates that a higher or a lower dosage is warranted, then this assessment will be provided to the stakeholders for review during one of the weekly stakeholder meetings prior to implementation of ORC Advanced™ injection. Section 3.1.7.1 of the Revised Work Plan has also been revised .to clarify the assessment documentation and review process.

Comment 97: Appendix E Oxygen Releasing Compound Injection Proposal, Building 228 Remedial Unit:
The figure, Typical Injection Barrier Layout, shows a typical injection array for the product "HRC." A note or description should be added which describes whether this figure is also representative of an array that would be appropriate for the ORC® product that is proposed at this site.

Response 97: The typographical error that noted "HRC" on the figure has been revised to indicate "ORC".

Comment 98: Appendix G Example Field Forms:
The cleanup levels presented on the form for Confirmation Sample Analytical Results should be revised to be the ones selected in the CAP for this site and not a different site with different cleanup levels.

Response 98: The Appendix G (Example Field Forms) of the Revised Draft Work Plan have been revised, and no longer include the cleanup levels for COCs. The cleanup levels are included in Figures 1-6 and 1-7 and on Tables 1-1 and 1-2. The excavation contractor and the MACTEC field staff will be provided a copy of the figures and the tables for use in the field.

Comment 99: Appendix G Example Field Forms:
The example sample number provided with the form for Confirmation Sample Analytical Results should be revised to represent a sample number typical of those which may be used on this project.

Response 99: Prior to field mobilization, MACTEC will obtain unique sample identification numbers from the Trust's database manager for use during the field work. An example of the sample numbering system to be used in the field is included in Appendix I, Section I-3.2.2, (Sample Numbering System) of the Revised Draft Work Plan.

Comment 100: Appendix H Erosion Monitoring Plan, Monitoring Period, H-1: This discussion indicates that this plan will be in effect after construction has been completed. The transition period for monitoring under this plan compared to the monitoring required under the SWPPP should be described. The SWPPP monitoring is proposed to continue for the first wet season following construction, approximately one year under the current schedule.

Response 100: Please see Response to Comment 82 that indicates Appendix A of the Revised Draft Work Plan has been revised to clarify the storm water pollution prevention and the erosion control measures that will be implemented during and for the first year following construction. The separate erosion monitoring plan has been eliminated.

Comment 101: Appendix H Erosion Monitoring Plan, Post-Construction Monitoring, H-3: This plan proposes that site inspection by the Trust be performed weekly and following significant storms under this plan. As noted in prior comments, it appears that this plan is proposed to be followed after the SWPPP termination; weekly wet season inspections do not appear to be necessary this far (approximately two years) past the completion of construction. These requirements should be reviewed and revised as necessary.

Response 101**:** Please see Response to Comment 82 that indicates Appendix A of the Revised Draft Work Plan has been revised to clarify the storm water pollution prevention and the erosion control measures that will be implemented during and for the first year following construction. The separate erosion monitoring plan has been eliminated.

MACTEC as the Trust's CM will perform erosion monitoring following construction. During the first year following construction, during the winter months (i.e., December 2008 through February 2009), weekly inspection will be conducted. For the remainder of the year, monthly inspection will be conducted.

Comment 102: Appendix H Erosion Monitoring Plan, Figure H-1 Erosion Control Details: This figure, which shows the proposed installation methods for erosion control features, such as waddles and silt fences, would be more appropriate to include in the work plan or the SWPPP instead of this plan which does not become effective until well after the construction is complete.

Response 102: The erosion and sediment control features are described in Section A.4.0(Erosion and Sediment Control Practices) of Appendix A of the Revised Draft Work Plan.

Comment 103: Appendix I Confirmation Sampling Plan, Section I-1.0 Introduction, page I-1: This plan clearly states that it applies to the sampling and analytical procedures for samples collected by the Engineer. The work plan includes samples that are to be

collected by more than one of the proposed contractors. The work plan should include description of how the sampling and analytical procedures for samples collected by these other parties will be managed.

Response 103**:** Appendix I (Confirmation Sampling Plan) of the Revised Draft Work Plan has been updated to identify the different parties responsible for the various types of sampling to be conducted at the Site.

Comment 104: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-3:
This section indicates that the engineer will use best judgment to determine the amount of additional soil that will be excavated should any confirmation samples exceed the appropriate cleanup levels. This plan should be revised to reflect the consultation and involvement from the stakeholders that will be employed during this process and that it is not the engineer's role to determine the amount of over excavation that is required. The process that was proposed by the Trust for the recent Commissary/PX project should be considered.

Response 104: Appendix I (Confirmation Sampling Plan), Section I-1.2.1 of the Revised Draft Work Plan has been updated to describe the consultation and involvement from stakeholders.

Comment 105: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-3:
The description of the over-excavation process should be expanded to address the situation where the confirmation sample results for the over-excavation area exceed the cleanup levels.

Response 105: Appendix I (Confirmation Sampling Plan), Section I-1.2.1 of the Revised Draft Work Plan has been updated to clarify the over-excavation process for areas where cleanup levels are exceeded in confirmation samples.

Comment 106: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-4:
In this section's discussion of the over-excavation process it is noted that a formal QA/QC data review will be performed but does not identify which data will be included in this review. In addition, the difference between formal data review and data validation should be described. The data QA/QC section of the work plan should clearly describe what data will be validated.

Response 106: Appendix I (Confirmation Sampling Plan), Section I-6.0 of the Revised Draft Work Plan includes an expanded discussion of the Data Validation and Data Management to be used for the project.

Comment 107: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-5:
This description of confirmation sampling indicates that for areas of over-excavation, additional confirmation sampling will only be performed for COCs that

exceeded cleanup levels in the original confirmation samples. This description should be revised to indicate that this reduction in parameters will be done by analytical suite, not by individual analyte.

Response 107: Appendix I (Confirmation Sampling Plan), Section I-1.2.1 of the Revised Draft Work Plan has been updated to clarify the confirmation sampling procedures for reduction in sampling parameters by analytical suite.

Comment 108: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-5:
This description incorrectly indicates that excavation will only proceed as far as the limits of the remedial unit identified in the work plan. This restriction is not appropriate for a "clean closure" remedy and should be revised.

Response 108: Appendix I of the Revised Draft Work Plan has been revised to eliminate the reference to the "limits of remedial unit". Section 2.6.1 (Horizontal Limits of Excavation) of the Revised Draft Work Plan has also been updated to describe the process to be used in the field to make over-excavation decisions.

Comment 109: Appendix I Confirmation Sampling Plan, Section I-1.2.1 Excavation Confirmation Sampling Methodology, page I-5:
The decision to collect additional samples is not just at the discretion of the Trust as noted here but may also be done at the request of the RWQCB or DTSC.

Response 109: Appendix I (Confirmation Sampling Plan), Section I-1.2.1 of the Revised Draft Work Plan has been updated to clarify decisions regarding collection of additional samples may also be made at the request of the regulatory agencies.

Comment 110: Appendix I Confirmation Sampling Plan, Section I-1.2.2 In-Situ Confirmation Sampling Methodology, page I-5:
This plan should be revised to specify how soon after the corrective action implementation that confirmation sampling of the Building 228 area will be conducted.

Response 110: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.5 of the Revised Draft Work Plan has been updated to clarify the schedule for confirmation sampling at the Building 228 RU

Comment 111: Appendix I Confirmation Sampling Plan, Section I-2.3.1 Sample Collection Process-Former Building 207 Remedial Unit (including Former Building 208 Sump), page I-8:
This discussion indicates that the 25 foot grid will be used to guide the collection of sidewall samples. This work plan should describe how this will be performed.

Response 111: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.3 of the Revised Draft Work Plan has been updated to clarify that the sampling will be performed by sampling at the mid-point of its height every 25 feet of its lateral extent.

Comment 112: Appendix I Confirmation Sampling Plan, Section I-2.3.1 Sample Collection Process-Former Building 207 Remedial Unit (including Former Building 208 Sump), Groundwater Sampling, page I-8:
The discussion of the groundwater monitoring well installation should be expanded to include discussion of the well construction details and methods. In addition, the sampling objectives for the well, such as desired screen depth or identification of the monitoring zone should be described.

Response 112: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.1 of the Revised Draft Work Plan has been expanded to include the well construction details and methods.

Comment 113: Appendix I Confirmation Sampling Plan, Section I-2.3.3 Sample Collection Process- Building 231 Remedial Unit, page I-9:
This discussion that a 50 foot sampling grid will be used to guide the confirmation sample collection should be revised to follow the CAP requirements that a 25 foot grid be used at this site. This work plan should be revised to be consistent with the requirements of the selected remedy presented in the CAP.

Response 113: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.3 of the Revised Draft Work Plan has been updated to be consistent with the CAP requirements of sampling on a 25 foot grid for each RU.

Comment 114: Appendix I Confirmation Sampling Plan, Section I-2.3.5 Sample Collection Process- Building 228 Remedial Unit, page I-10:
The schedule for the Building 228 confirmation sampling should be provided and a description of how construction completion will be obtained for this project if this element of the implementation is not performed prior to the completion of the construction completion report.

Response 114: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.5 of the Revised Draft Work Plan has been updated to summarize the proposed schedule for the ORC Advanced™ injection field activities that will be described in the Construction Completion Report. For the confirmation sampling to be conducted in the Building 228 RU ORC Advanced™ injection remedial area approximately two years after injection, MACTEC will prepare a Work Plan prior to the field work and a report describing the confirmation sampling after completion of the field work for approval by the Water Board and the stakeholders. Sections 3.1.7 and 5.0 of the Revised Draft Work Plan summarize the reporting and documentation requirements for each of the RUs, and the specific scheduling timeframes for the components of the Building 228 RU corrective actions.

Comment 115: Appendix I Confirmation Sampling Plan, Section I-2.3.5 Sample Collection Process- Building 228 Remedial Unit, Groundwater Sampling, page I-11:
As described in Appendix E, the plan for the installation of the ORC® calls for a round of groundwater sampling prior to the injection of the product. The discussion of the installation of this new Building 228 monitoring well should discuss the timing of the installation and sampling of this well.

Response 115: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.5 of the Revised Draft Work Plan has been revised to provide the schedule for well installation and sampling. The new well, New Well 1, will be installed approximately one month and three months prior to ORC Advanced™ Injection and excavation, respectively. The well will be samples following development.

Comment 116: Appendix I Confirmation Sampling Plan, Section I-2.3.5 Sample Collection Process- Building 228 Remedial Unit, page I-11:
This section indicates that an "assessment of potential vapor phase intrusion to indoor air" will be performed after the corrective action has been implemented at this site. The CAP discusses that cover improvements and air monitoring would be part of the remedy. This discussion should be revised to include all of the CAP required elements in the CAP implementation phase of this remedy.

Response 116: Appendix I (Confirmation Sampling Plan), Section I-1.2.3.5 of the Revised Draft Work Plan has been updated to indicate that EKI will perform the assessment of vapor phase intrusion to indoor air after completion of the excavation activities and perform corrective actions as necessary and described in Appendix H, (Building 228 Indoor Air and Cap Assessment Work Plan). The results of the work and any corrective action measures will be included in the Construction Completion Report.

Comment 117: Appendix I Confirmation Sampling Plan, Section I-3.1 Sample Collection, page I-12:
This section indicates that confirmation sample locations will be marked and those that meet the cleanup levels will be surveyed. The plan should describe which contractor will conduct this portion of the work and how this survey will be integrated into the other site surveys that are planned.

Response 117: Appendix I (Confirmation Sampling Plan), Section I-1.3.1, and Section 3.2.7 (Excavation Survey) of the Revised Draft Work Plan has been updated to clarify that a licensed land surveyor under contract with the excavation contractor will survey the confirmation sample locations; these locations will be presented by the land surveyor on the excavation record survey map, which will document the topographic condition following the completion of excavation.

Comment 118: Appendix I Confirmation Sampling Plan, Section I-3.1.1 Sampling Equipment Decontamination, page I-13:
This section indicates that decontamination will be performed in accordance with the specifications of the QAPP but does not identify the specific actions that are to be performed. This approach requires that, in addition to this work plan, the field crews have readily available in the field, the Trust's QAPP. This approach does not appear to be efficient and this plan should describe how these large documents will be managed during the field program.

Response 118: Appendix I (Confirmation Sampling Plan), Section I-1.3.1 of the Revised Draft Work Plan has been updated to clarify that that MACTEC's field crew will be provided copies

of the specific sections of the QAPP that document the procedures to be followed for equipment decontamination.

Comment 119: Appendix I Confirmation Sampling Plan, Section I-3.2.2 Sample Numbering System, page I-14:
This discussion should describe the actions that will be taken to ensure that sample numbers that are used during this project are unique and have not previously been used at the Presidio.

Response 119: Appendix I (Confirmation Sampling Plan), Section I-1.3.2.2 has been updated to clarify that prior to field mobilization, MACTEC will obtain prepare a sampling and analysis plan, which includes a list of samples and sample identification numbers for approval by the Trust's database manager.

Comment 120: Appendix I Confirmation Sampling Plan, Section I-3.2.2 Sample Numbering System, page I-14:
This description of the proposed sample numbering system should describe how the samples other than confirmation samples will be numbered.

Response 120: Appendix I (Confirmation Sampling Plan), Section I-1.3.2.2 of the Revised Draft Work Plan has been updated to clarify how the samples other than confirmation samples will be numbered.

Comment 121: Appendix I Confirmation Sampling Plan, Section I-3.3 Quality Assurance and Quality Control Sampling, page I-16:
This description of QA/QC sampling should be expanded to provide detail regarding the collection of duplicate soil samples and instruction on how the past problems regarding the collection of soil duplicate samples will be avoided.

Response 121: Appendix I (Confirmation Sampling Plan), Section I-1.3.2.2 of the Revised Draft Work Plan has been updated to provide protocols for the sample numbering system to be used for duplicate samples. The field logs and sample collection logs will also indicate the source location of the duplicate sample for correlation purposes. Further, MACTEC and the Trust will confirm that each duplicate sample collected in the field will have a unique identification number. For example, if more than one field duplicate is collected on the same date, a suffix (i.e., - "1" or "2") will be used to maintain unique identification numbers.

Comment 122: Appendix I Confirmation Sampling Plan, Section I-3.3 Quality Assurance and Quality Control Sampling, page I-16:
This description indicates that the number of equipment blanks will not exceed 10% of the total number of primary samples. The plan should describe how this will be controlled to ensure that this level is not exceeded.

Response 122: Appendix I (Confirmation Sampling Plan), Section I-1.3.3 of the Revised Draft Work Plan has been updated to clarify that in accordance with the Presidio-Wide QAPP, the equipment blank samples will be collected each sampling day, but not to exceed 10% of

the primary samples. MACTEC will maintain a sample tracking form, which tracks all the samples collected (primary and QC samples) and the equipment blank samples. This tracking will allow MACTEC to confirm that the QAPP requirements are met.

Comment 123: Appendix I Confirmation Sampling Plan, Section I-4.1 Analytical Methods-Former Building 207 Remedial Unit (Including Former Building 208 Sump), page I-17: The description of the TPH analytical methods indicates that specified carbon ranges will be used but does not identify what they will be. The specific TPH carbon ranges proposed for laboratory quantification should be identified.

Response 123: Appendix I (Confirmation Sampling Plan), Section I-4.0 has been revised to indicate the specific TPH carbon ranges proposed for laboratory quantification per Table 2-6.3-1 of the Presidio-Wide QAPP.

Comment 124: Appendix I Confirmation Sampling Plan, Section I-4.1 Analytical Methods-Former Building 207 Remedial Unit (Including Former Building 208 Sump), page I-17: The use of silica gel laboratory preparation [EPA Method #3630A] should be required for TPHd and TPHfo analyses.
This comment was previously made in the September 20, 2006 NPS comments on the Building 207/231 Corrective Action Implementation Work Plan, Draft Bulleted Outline, dated September 18, 2006.

Response 124: Appendix I (Confirmation Sampling Plan), Section I-4.0, has been revised to indicate silica gel laboratory cleanup for TPH-d and TPH-fo analyses is required.

Comment 125: Appendix I Confirmation Sampling Plan, Section I-5.0 Investigation Derived Waste, page I-22:
This discussion of investigation derived waste does not appear to consider that the proposed work is not an investigation, but is a soil removal operation. It does not appear cost effective, or necessary, to place used PPE and decontamination water in drums for disposal. The management practices proposed for these wastes should be reviewed and revised as appropriate.

Response 125: Appendix I (Confirmation Sampling Plan), Section I-5.0, has been revised to indicate that for sampling to be conducted during soil excavation (i.e., confirmation sampling and stockpile sampling), the sampling related waste will be placed in the soil stockpiles and disposed off-site along with the excavation spoils. Decontamination, purge, or equipment rinsate water generated during soil removal activities will be transferred to the onsite storage tanks (Baker tanks) used to store extracted groundwater in accordance with the SWPP requirements described in Appendix C (Dewatering Plan).

For in-situ and groundwater sampling to be conducted prior to and after completion of excavation activities, the IDW generated will be contained and sealed in 55-gallon drums and transferred to the Central Magazine area, where it will be profiled. Soil waste will be transported off-site to appropriate landfill facilities and groundwater (provided it meets Trust's industrial wastewater permit requirements) will be discharged into the sanitary sewer system.

Comment 126: Appendix I Confirmation Sampling Plan, Section I-6.0 Quality Control Requirements, page I-23:
The discussion in this section specifically proposes that data validation is not to be performed on sampling of the proposed backfill material. The reason why this recommendation is made should be described in this section.

Response 126: Appendix I (Confirmation Sampling Plan), Section I-6.0 has been revised to indicate that the backfill samples will be subject to the data validation protocols for confirmation samples.